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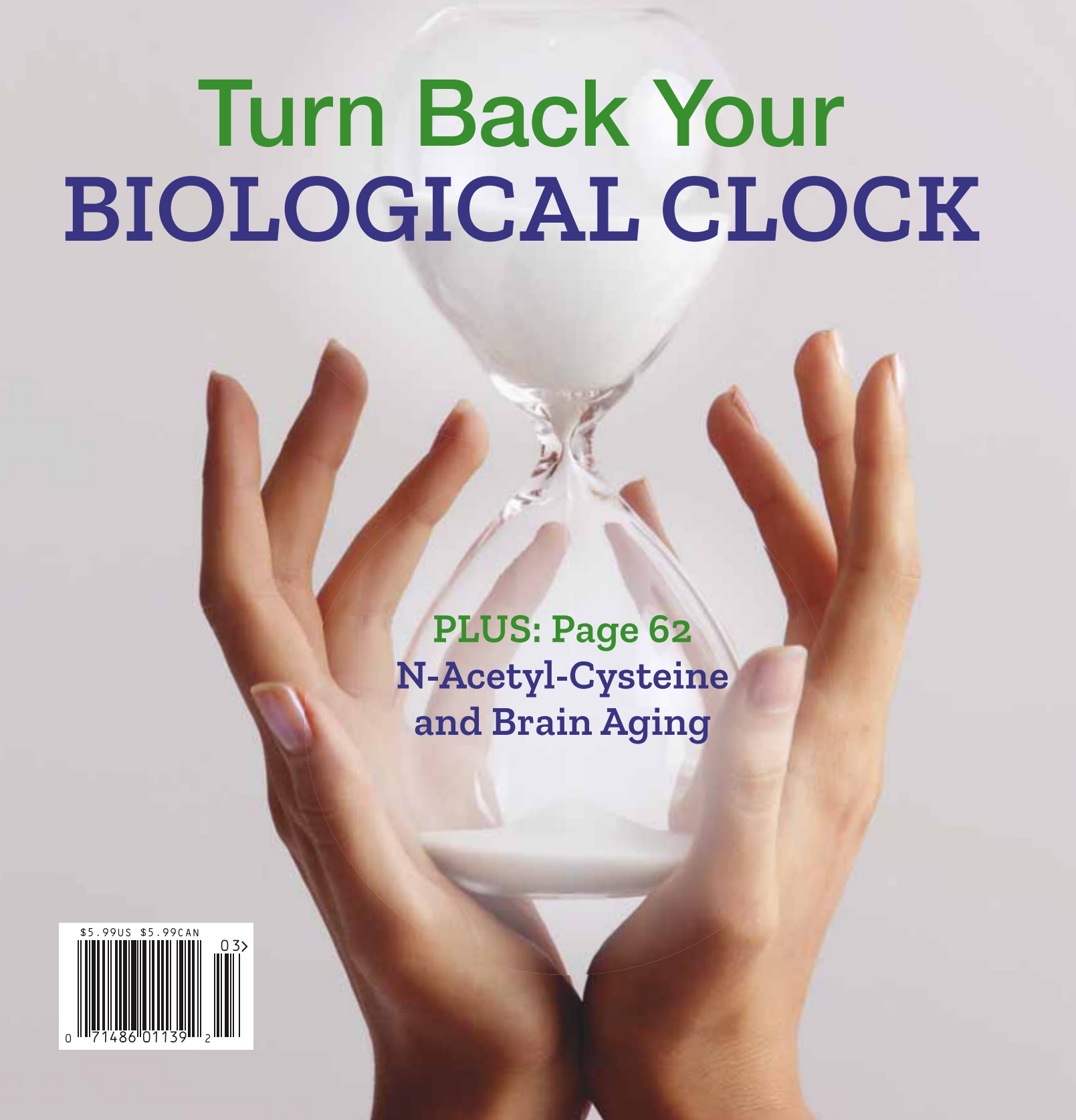
March 2022

FEATURE ARTICLES

Turn Back Your BIOLOGICAL CLOCK



PLUS: Page 62
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* *Br J Pharmacol.* 2004 Mar;141(5):825-30.

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LIFE EXTENSION®

The Science of a Healthier Life®

LifeExtension.com March 2022

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REPORTS

ON THE COVER

TURN BACK YOUR BIOLOGICAL CLOCK

Articles throughout this month's issue describe scientific findings and practical approaches as to what people are doing today to defy pathologic **aging** and extend their **healthy lifespans**.

DEPARTMENTS

LIFE EXTENSION®

The Science of a Healthier Life®

LifeExtension.com March 2022

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MEDICAL ADVISORY BOARD

Sandra C. Kaufmann, MD, is a fellowship-trained and board-certified pediatric anesthesiologist as well as the Chief of Anesthesia at the Joe DiMaggio Children's Hospital in Hollywood, Florida. She is the founder of The Kaufmann Anti-Aging Institute and the author of the book The Kaufmann Protocol: Why we Age and How to Stop it (2018). Her expertise is in the practical application of anti-aging research.

Richard Black, DO, is a dedicated nuclear medicine physician practicing as an independent contractor out of Cleveland, Ohio. Dr. Black is board certified in internal medicine and nuclear medicine, and is licensed to practice medicine in multiple states throughout the United States.

John Boik, PhD, is the author of two books on cancer therapy, Cancer and Natural Medicine (1996) and Natural Compounds in Cancer Therapy (2001). He earned his doctorate at the University of Texas Graduate School of Biomedical Sciences with research at the MD Anderson Cancer Center, focusing on screening models to identify promising new anti-cancer drugs. He conducted his postdoctoral training at Stanford University's Department of Statistics.

Aubrey de Grey, PhD, is a biomedical gerontologist and Editor-in-Chief of Rejuvenation Research, the world's highest-impact, peer-reviewed journal focused on intervention in aging. He received his BA and PhD from the University of Cambridge in 1985 and 2000 respectively. Dr. de Grey is a Fellow of both the Gerontological Society of America and the American Aging Association and sits on the editorial and scientific advisory boards of numerous journals and organizations.

Deborah F. Harding, MD, is founder of the Harding Anti-Aging Center. She is double board-certified in internal medicine and sleep disorder medicine. She also earned the Cenegenics certification in age management medicine. She is a faculty member of the University of Central Florida Medical School.

Steven B. Harris, MD, has participated in groundbreaking hypothermia, cryothermia, and ischemia research. His research interests include antioxidant and dietary-restriction effects in animals and humans.

Peter H. Langsjoen, MD, FACC, is a cardiologist specializing in congestive heart failure, primary and statin-induced diastolic dysfunction, and other heart diseases. A leading authority on coenzyme Q10, Dr. Langsjoen has been involved with its clinical application since 1983. He is a founding member of the executive committee of the International Coenzyme Q10 Association, a fellow of the American College of Cardiology, and a member of numerous other medical associations.

Dipnarine Maharaj MD, MB, ChB, FRCP (Glasgow), FRCP (Edinburgh), FRCPath., FACP, is the Medical Director of the Maharaj Institute of Immune Regenerative Medicine, and is regarded as one of the world's foremost experts on adult stem cells. He received his medical degree in 1978 from the University of Glasgow Medical School, Scotland. He completed his internship and residency in Internal Medicine and Hematology at the University's Royal Infirmary.

L. Ray Matthews, MD, FACS, is a professor of surgery and director of Surgical Critical Care at Morehouse School of Medicine in Atlanta, GA, and a trauma and critical care surgeon at Grady Memorial Hospital. He has published widely and is known as one of the top vitamin D experts. Dr. Matthews has spoken before the U.S. Food and Drug Administration several times, presenting a recent update about clinical research on vitamin D.

Ralph W. Moss, PhD, is the author of books such as Antioxidants Against Cancer, Cancer Therapy, Questioning Chemotherapy, and The Cancer Industry, as well as the award-winning PBS documentary The Cancer War. Dr. Moss has independently evaluated the claims of various cancer treatments and currently directs The Moss Reports, an updated library of detailed reports on more than 200 varieties of cancer diagnoses.

Michael D. Ozner, MD, FACC, FAHA, is a board-certified cardiologist who specializes in cardiovascular disease prevention. He serves as medical director for the Cardiovascular Prevention Institute of South Florida and is a noted national speaker on heart disease prevention. Dr. Ozner is also author of The Great American Heart Hoax,The Complete Mediterranean Diet and Heart Attack Proof. For more information visit www.drozner.com.

Jonathan V. Wright, MD, is medical director of the Tahoma Clinic in Tukwila, WA. He received his MD from the University of Michigan and has taught natural biochemical medical treatments since 1983. Dr. Wright pioneered the use of bioidentical estrogens and DHEA in daily medical practice. He has authored or co-authored 14 books, selling more than 1.5 million copies.

Xiaoxi Wei, PhD, is a chemist, expert in supramolecular assembly and development of synthetic transmembrane nanopores with distinguished selectivity via biomimetic nanoscience. She has expertise in ion channel function and characterization. She founded X-Therma Inc., a company developing a radical new highway towards non-toxic, hyper-effective antifreeze agents to fight unwanted ice formation in regenerative medicine and reduce mechanical icing.

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AGE-REVERSAL UPDATE

WILLIAM FALOON

Readers of this magazine learn about healthy choices they can make today to reduce disease risk and slow premature aging.

We also fund **research** that aims to reverse biological aging.

It was not until **2015** that the scientific community began to recognize that current techniques may enable partial **age reversal** to occur.

Our goal in studying emerging **rejuvenation** treatments is to validate what works, what fails, and what potencies are needed to provide real-world benefits.

An example is **senolytics**, where the purpose is to remove **senescent cells** that otherwise inflict massive tissue damage.[1,2]

The importance of this research is such that it is being funded by a grant from the **National Institutes of Health**.[3-5]

We are assisting a major university in identifying blood markers to enable precise dosing of **senolytic** compounds like **quercetin** and **fisetin**.

Even the **federal government** recognizes that if validated **senolytic treatments** become widely available, **Medicare** can be spared astronomical medical financial outlays.

I receive invitations to speak at conferences and have been given honorariums as high as **$30,000**. These groups are eager to learn what they might do to reverse degenerative changes in their aged bodies.

I donate all honorariums to **charitable** organizations that are engaged in **research** that has no profit motive.

This means that **discoveries** can be made available to **humanity** without delays caused by patent applications and intellectual property disputes.

As a reader of this magazine, you don't pay anything for the information described in the article on **page 74** of this month's issue.

The article is titled "**The Prospect of Human Age Reversal**" and contains highlights from a conference at which I presented.

Your support via supplement purchases and blood tests enables us to fund these **rejuvenation** research initiatives.

For those seeking to **delay aging** today, the article on **page 18** reveals fascinating data on how eating a particular food group can add healthy **years** to your **life expectancy**.

For longer life,

William Faloon, Co-Founder
Life Extension Buyers Club

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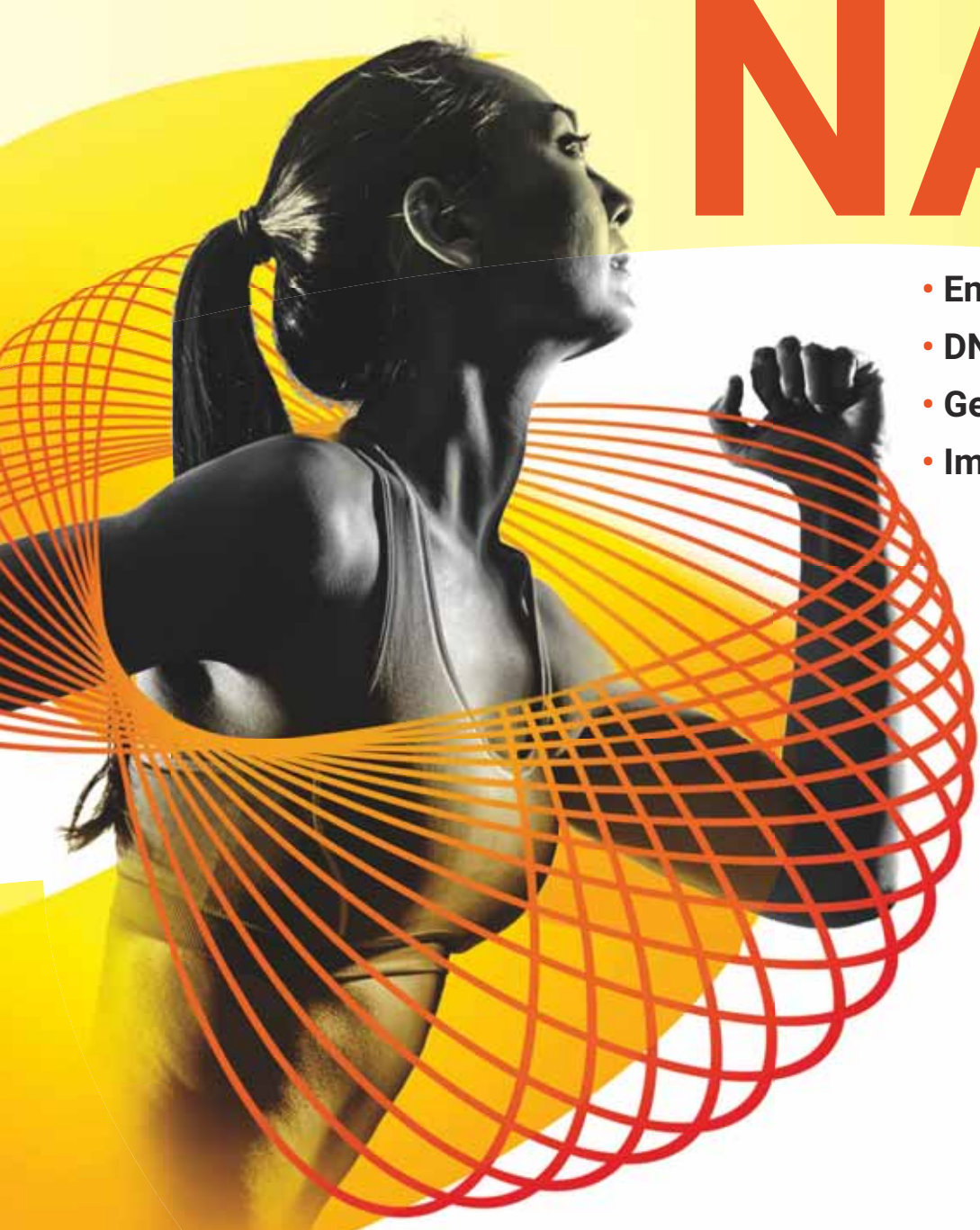
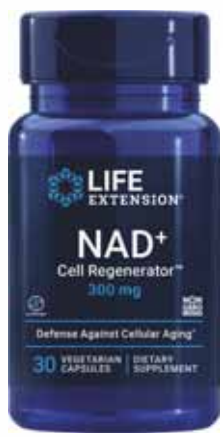


- **Energy production**
- **DNA repair**
- **Gene expression** (Sirtuin 1-7)
- **Immune cell signalling**



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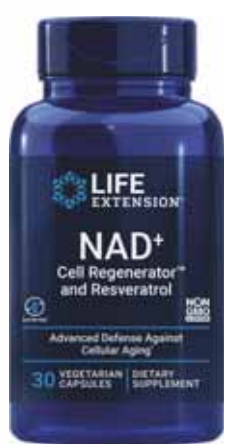
1 bottle*



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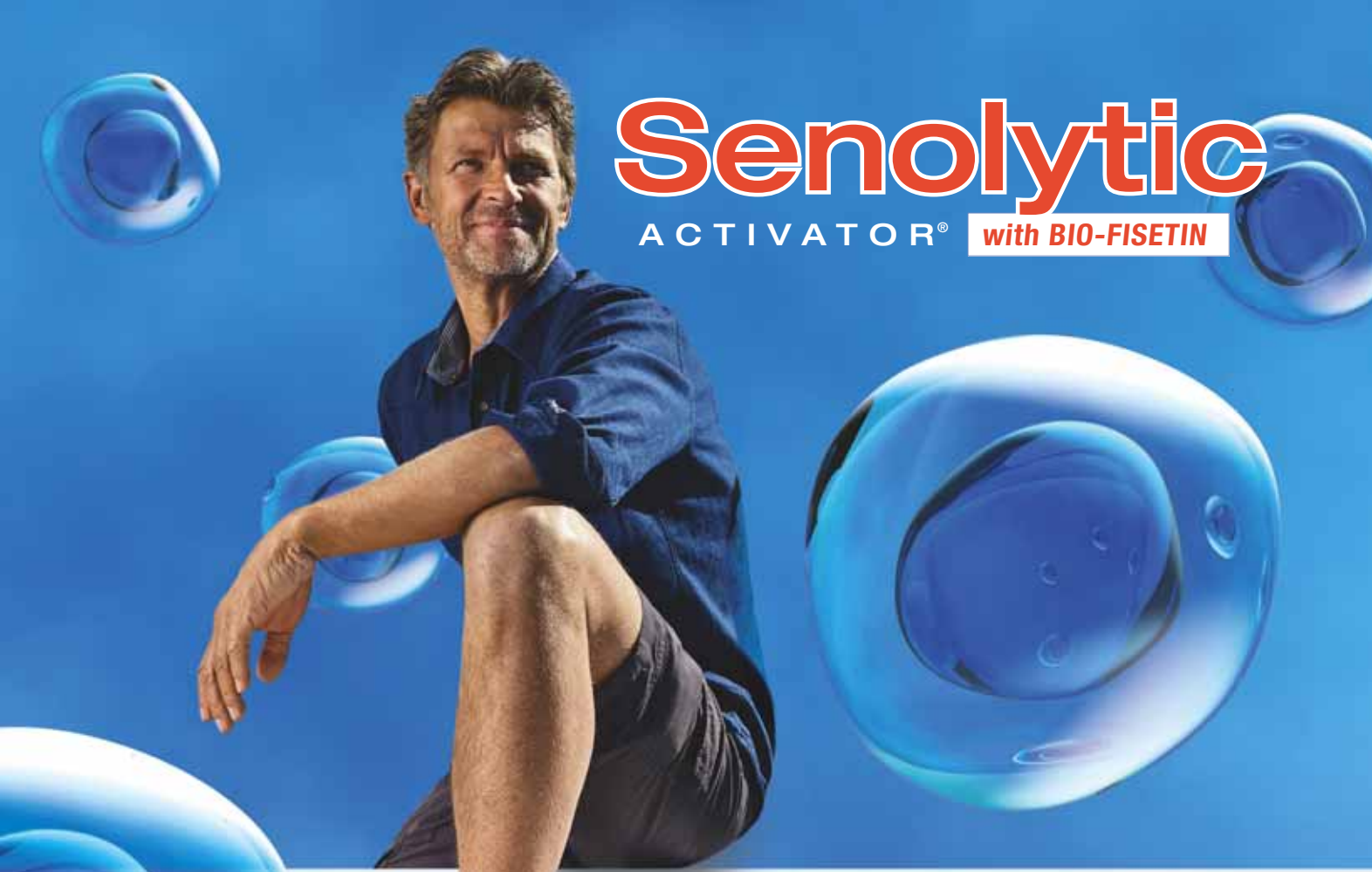

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With age, our body accumulates **senescent cells** that affect the day-to-day function of the healthy cells around them.

Senolytics are compounds that selectively remove senescent cells.

Senolytic Activator® contains nutrients designed to target senescent cells for normal elimination.

The new formula contains a patented **fisetin** that is more **bioavailable** than regular fisetin.

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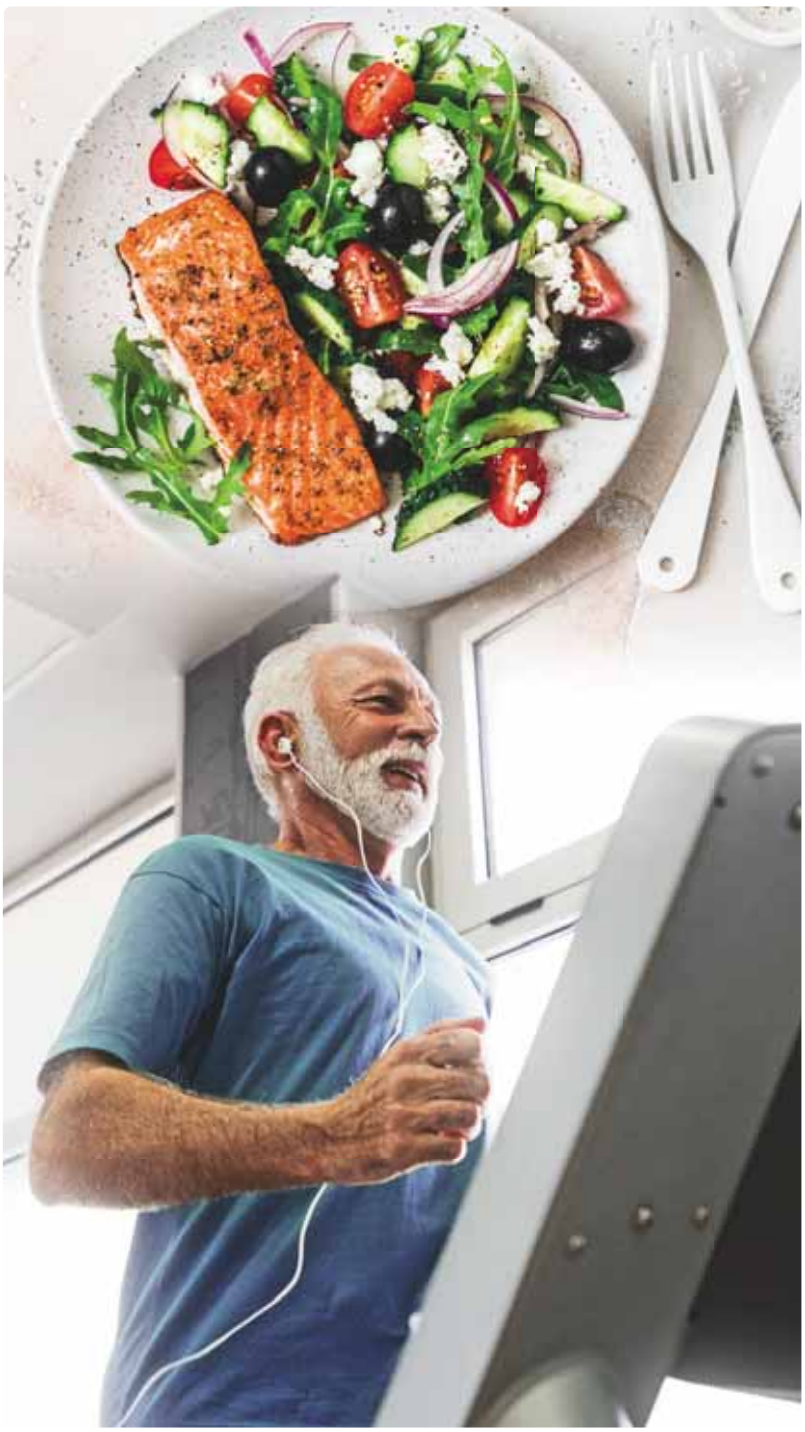
- **BIO-FISETIN** (up to **25 times** greater bioavailability)

The suggested dose of the **Senolytic Activator®** is **3 capsules** once a week. Each bottle lasts 3 months and costs very little.

In the News



Mediterranean Diet Can Lower Risk of Sudden Cardiac Death by 25%-26%

A lower risk of sudden cardiac death is associated with greater adherence to a Mediterranean diet, a study in the *Journal of the American Heart Association* reported.* The study also found a trend toward a *higher* risk of sudden cardiac death associated with greater intake of a Southern dietary pattern.

The **Mediterranean diet** foods included vegetables, fruits, legumes, cereals, and fish.

The **Southern** pattern included added fats, fried food, eggs and egg dishes, organ meats, processed meats, and sugar-sweetened beverages.

Among 21,069 men and women aged 45 years and older, 401 sudden cardiac deaths occurred during an average 9.8 years of follow-up. People whose Mediterranean diet scores placed them among the top one-third of participants had a **25%-26%** lower risk of sudden cardiac death than subjects whose scores were among the lowest third.

People whose Southern dietary pattern score was among the top quarter of participants had a **46%** *higher* risk of sudden cardiac death than those among the lowest quarter.

Editor's Note: The protective effect of the Mediterranean diet was limited to participants with no history of coronary heart disease at the beginning of the study.

* *J Am Heart Assoc.* 2021 Jul 6;10(13): e019158.

Better Response to Stress with French Oak Wood

A group of nurses who received supplements containing an extract of French oak wood showed improvement in their responses to stress, according to a pilot study reported in *Minerva Medica*.*

Participants were evaluated for signs of stress and fatigue in addition to levels of oxidative stress.

After four weeks, assessed stress factors significantly improved in the group that received **300 mg** per day of French oak wood compared to the beginning of the study, and compared to the matched control group.

"The supplementation significantly improved the objective perception of fatigue in comparison with controls. A practical professional score evaluation provided an indication of professional attitude and stamina, in difficult, stressful working conditions under continuous pressure," researchers stated.

Editor's Note: The nurses were evaluated as part of a cardiovascular screening program.

* *Minerva Med*. 2021 Sep 20.

How Omega-3 Helps Protect Against Depression

Research reported in *Molecular Psychiatry* contributes to an understanding of omega-3 fatty acids' ability to combat **depression**.*

In cells derived from the brain's hippocampus, treatment with the omega-3 fatty acids EPA and DHA prevented the increase in cell death and decrease in neuron formation that would have otherwise resulted from exposure to inflammatory cytokines.

An in vitro study was replicated in a clinical study among a small sample of 22 individuals with Major Depressive Disorder. They received **3 grams** of EPA or **1.4 grams** of DHA daily for 12 weeks.

Either fatty acid (EPA or DHA) was associated with an increase in lipid mediator metabolites and improvement in depressive symptoms.

Editor's Note: "In summary, our study confirms and extends previous evidence for the antidepressant, anti-inflammatory and neuroprotective abilities of EPA and DHA," the authors stated.

* *Mol Psychiatry.* 2021 Jun 16.

Dietary Supplements Linked to Improved Prognosis for Breast Cancer Patients

A meta-analysis published in the journal *Cancers* found associations between *improved* breast cancer outcomes and the intake of multivitamins and other nutrients.*

Sixty-three studies including a total of 120,167 breast cancer patients were analyzed.

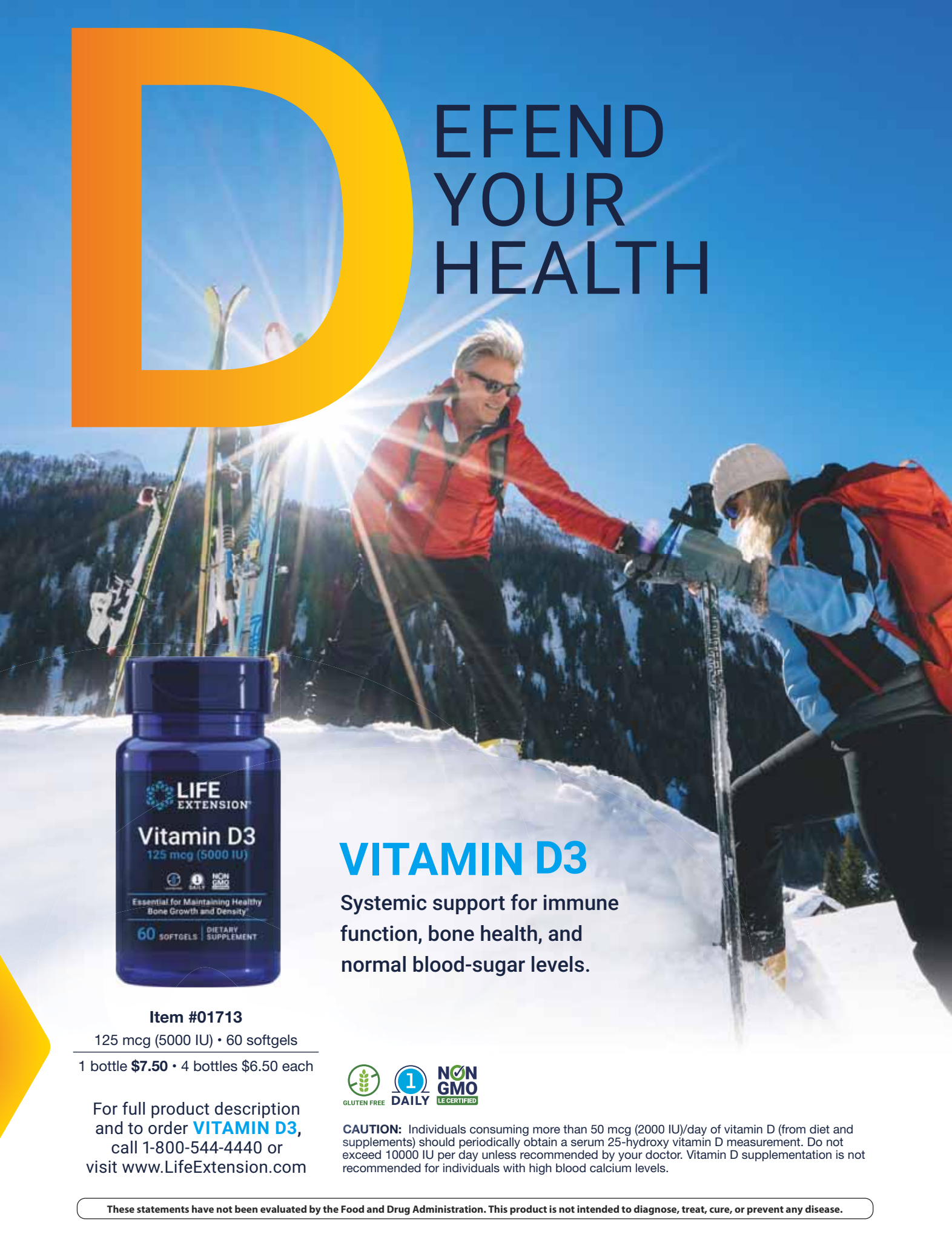
For participants in studies that evaluated the effects of multivitamins, the risk of mortality was **12%** lower, and **17%** lower among those who took antioxidant supplements.

Studies that examined vitamin C's effects on breast cancer-specific mortality showed that vitamin C intake amount among the top **25%** was associated with an **18%** lower risk of death.

Editor's Note: "Furthermore," the authors concluded, "we performed subgroup analyses by menopausal status and dietary or supplementary micronutrient intake. Most trends were similar to the main findings; in particular, the vitamin C, vitamin D, and vitamin E supplements decreased the risk of mortality."

* *Cancers.* 2021 Oct 23.

DEFEND YOUR HEALTH



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What's in MUSHROOMS That Supports Healthy Aging?

BY JULIE RICH

A landmark study published in **April 2021** followed the dietary patterns of 15,000 Americans for nearly **20 years**.[1]

Compared to no consumption, those who consumed **mushrooms** in their diet had a **16%** lower overall **mortality** risk.

When one serving a day of **mushrooms** was ingested in place of processed or red meats, there was a **35%** reduction in all-cause mortality.

A trend toward even lower **mortality** was found in people who consumed *higher* amounts of **mushrooms**.

So, what's in **mushrooms** that enables people to **live longer**?

It turns out that **mushrooms** contain more of an amino acid called **L-ergothioneine** than other food sources.[2,3]

This has spurred researchers to find out how **L-ergothioneine** works in the body.

As you will read, **L-ergothioneine** appears to protect **DNA** and reduce the shortening of **telomeres**.

The article describes the longevity benefits observed in humans who consume edible mushrooms, which contain the amino acid **L-ergothioneine**!

What is L-Ergothioneine?

L-ergothioneine is an amino acid not produced by the human body.[5]

L-ergothioneine levels peak in early adulthood and steadily decline with age as the body loses its ability to accumulate this powerful nutrient.[6,7]

It is found in the *highest* concentration in **mushrooms** and other fungi. Miniscule amounts are found in plants that have taken it up from the soil.

To obtain meaningful quantities, **L-ergothioneine** must be acquired through **diet** (eating lots of mushrooms) or as a standardized supplement.[7-9]

Unfortunately, L-ergothioneine is not commonly found in the American diet. This is largely due to low consumption of mushrooms and industrial farming practices, making supplementation the best option. It would take about 2-5 cups of the common white button mushrooms to equal **5 mg** of L-ergothioneine.[10,11]

When L-ergothioneine intake in America was compared with intake in Europe, researchers found that Europeans had greater longevity possibly due to higher L-ergothioneine intake.[12]

Most tissues of the body contain L-ergothioneine.[7,8] It is concentrated in *higher* degrees in cells at greatest risk of injury due to **oxidative stress** and **inflammation**, including blood, bone marrow, eye lens, brain, liver, and skin.[7,8]

L-ergothioneine ***transporters*** are also found in the placenta and mammary glands, suggesting its importance in the early development of the embryo and newborn children.[7]

Scientific Findings

A major finding catapulted **L-ergothioneine** into the scientific spotlight.

Humans produce a **transporter protein** that takes up **L-ergothioneine** from the diet and distributes it into cells throughout the body.[4]

Although this protein can carry other compounds, it transports L-ergothioneine ***100 times*** more efficiently than other **nutrients**.

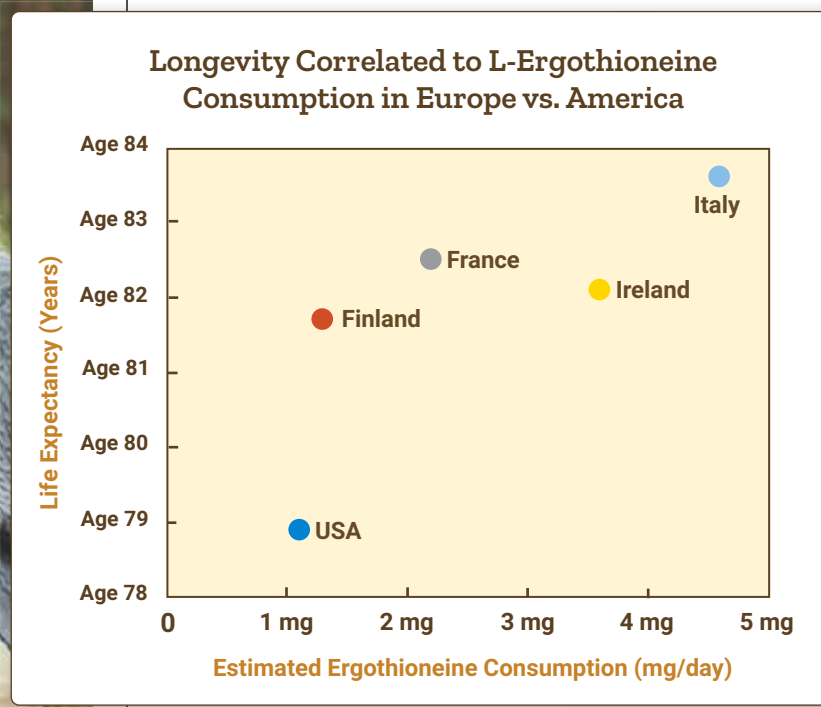
This preferential treatment given to **L-ergothioneine** indicates the important role it plays in the body.

Promising Studies

Observational studies have found evidence that **L-ergothioneine** may be critical to healthy aging. They have even shown a correlation between blood levels and overall **life expectancy.**

One study compared the average daily intake of L-ergothioneine among several developed countries.[12]

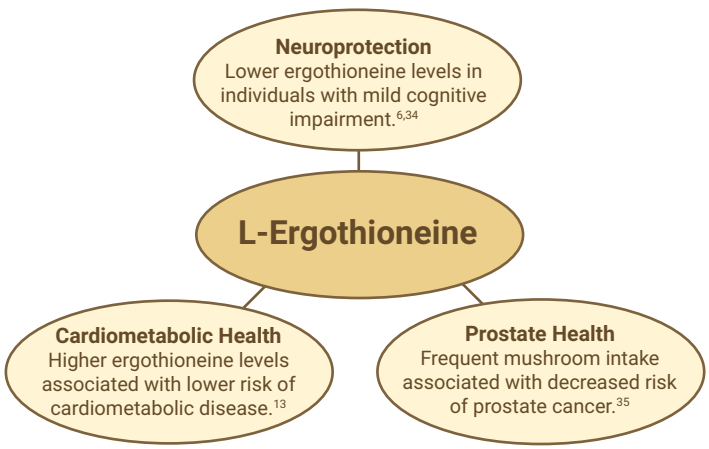
The countries with the *lowest* intake, such as the United States, had a lower average life expectancy.



* Figure adapted from Beelman et al. 2020.

WHAT YOU NEED TO KNOW

L-Ergothioneine: Potential Health Benefits



Countries with the *highest* intake have a considerably *longer* average **lifespan**.

Italians, on average, ingest more than **four times** *greater* amounts of **L-ergothioneine** daily compared to people in the United States.[12]

Studies are finding that *higher* blood levels of **L-ergothioneine** are associated with lower incidence of:

- Cardiovascular disease[13]
- Cognitive decline/mild cognitive impairment[6]
- Parkinson's disease[14]
- Crohn's disease (an inflammatory bowel disease)[15]
- Frailty[16]
- Death from cardiovascular disease or ***death from any cause***[13]

Defend Cells and Tissues Against Harm

- **L-ergothioneine** is an amino acid that is found in mushrooms and other fungi.
- The human body cannot produce L-ergothioneine, but human cells express a **transporter** that is highly specific for L-ergothioneine, facilitating its transport into cells and mitochondria.
- The existence of this specific transporter is highly suggestive that L-ergothioneine is an essential compound in the body. And because it has been found to play an important role in **cellular protection**, this has led to an explosion of medical research into the nutrient in recent years.
- Observational studies show that *higher* L-ergothioneine intake and blood levels correlate with *longer* **life expectancy** and *reduced* risk for several age-related conditions, including heart disease and cognitive decline.

Levels of **L-ergothioneine** also appear to be depleted in tissues that have undergone age-related injury and loss of function.

For example, people with **cataracts** have *lower* levels of L-ergothioneine than those with healthy eye lenses. The degree of the compound's depletion correlates with the severity of **cataract formation.**[17]

L-ergothioneine intake is thought to be very limited in the typical U.S. diet.[12] Levels also tend to decline with advancing age.[6,18,19] Oral intake can effectively raise blood levels.[20]

Potential Mechanisms of Protection

L-ergothioneine appears to be a normal component of a tissue's defense against injury.[7,8]

L-ergothioneine has a sulfur-containing group that puts it in a class related to **glutathione**, one of the most powerful **antioxidants** produced in the body.[21,22]

In cells, L-ergothioneine concentrates in the **mitochondria**, an organelle vulnerable to oxidative stress. Preclinical evidence shows that L-ergothioneine can help neutralize oxidizing compounds *before* they damage mitochondria and other cellular structures.[23,24]

Protecting Against DNA Damage

The amount of **damage** inflicted on cellular **DNA** is underestimated.

Be it background radiation or normal metabolic processes, our DNA is constantly "**broken**" and then "**repaired**" utilizing specialized *coenzymes* that are depleted with normal aging.

Failure to **repair** damaged DNA can result in cells transforming into a malignant or senescent state.

The ability of L-ergothioneine to **protect DNA** is promising.

For example, **ultraviolet (UV) radiation** damages the **DNA** of skin cells and accelerates **aging** of the skin and risk of skin cancers.

L-ergothioneine has been shown to ***absorb UV light*** at the same wavelengths that DNA does.[8,25,26] This suggests that it can act as a kind of built-in "sunscreen" in skin cells. This mechanism may help prevent DNA damage and help **DNA repair** processes in cells exposed to UV radiation.[27]

Maintaining *Longer* Telomeres

Another contributor to the aging process is the loss of **telomere** structure, the protective caps on the ends of chromosomes.[28]

With advancing age, these structures are shortened, which is a marker of cellular aging, loss of function, and eventual cell death.

Protecting **telomeres** to maintain vitality has long been a focus of anti-aging research.

A study published in **2020** found that L-ergothioneine significantly *reduced* the rate of **telomere shortening** and *decreased* the number of short telomeres in cells exposed to oxidative-stress conditions.[29]

These and other mechanisms explain why L-ergothioneine may help promote healthy longevity.

EVIDENCE OF EFFICACY

Nutrients like **coenzyme Q10** had a wealth of **clinical trial** data to support its benefits when introduced to Americans in 1983.

As it relates to **L-ergothioneine**, a natural component of **mushrooms**, there is a current lack of clinical data since it has not been used as a "drug" in other countries as CoQ10 was in Japan.

What we have is strong correlational data that indicate the value of boosting one's intake of **L-ergothioneine** by eating lots of safe, edible **mushrooms** or taking a standardized supplement.

A study published in **April 2021** looked at 15,000 people for nearly 20 years.[1] Those who consumed **mushrooms** in their diet had a **16%** lower overall **mortality** risk, compared to no consumption.

When consuming just one serving a day of **mushrooms** in place of processed or red meats, there was a **35%** lower all-cause mortality risk reduction.

This study also found a trend for people who consumed high amounts of mushrooms with even lower all-cause death rates. The authors of this 2021 published study concluded:[1]

"Mushroom consumption was associated with a lower risk of total mortality in this nationally representative sample of U.S. adults."

Mushrooms contain more **L-ergothioneine** than other food sources, which has enabled much correlational data to consider adding it to a healthy longevity program, in the form of daily mushroom ingestion and/or a supplement.

Here are some study summaries that provide tantalizing benefits in support of **L-ergothioneine**:

A **2020** longitudinal metabolomic study was conducted in Sweden involving over 3,200 study subjects. It showed that out of 112 metabolites measured at baseline, plasma **L-ergothioneine** levels were the most *strongly* associated with decreased risk of cardiovascular disease and reduced mortality after **21.4 years** of follow-up.[13]

A **2016** study showed that L-ergothioneine blood levels in human subjects decline with age and declined faster in those who show cognitive impairment compared to age-matched individuals with no cognitive impairment.[6]

In a similar study, blood L-ergothioneine levels were lower in individuals with Parkinson's disease than in age-matched individuals without the disease.[14]

Americans have been estimated to consume less L-ergothioneine (**1.1 mg/day**) than individuals in several European countries (up to **4.6 mg/day** in Italy). This **lower** intake correlates with a greater prevalence of chronic neurological diseases and shorter life expectancies in a **2015** published study.[30]

A **2019** study corroborated these data and showed that lower intake of **L-ergothioneine** coincides with a greater prevalence of degenerative brain disorders and lower life expectancies.[31]

Bruce Ames and Longevity

One of the world's pre-eminent nutritional biochemistry researchers, **Dr. Bruce Ames**, has brought increased attention to the benefits and potential of **L-ergothioneine**.

Dr. Ames' career has spanned decades, encompassing over 550 scientific publications and numerous scientific awards and honors.[32,33]

In 2018, he published a ground-breaking review paper on the longevity-supporting promise of a number of nutritional compounds, including **L-ergothioneine**. This pushed L-ergothioneine toward the forefront of the list of innovative nutrients being investigated to **prolong lifespan** and healthspan.[9]

Summary

L-ergothioneine is an amino acid found predominantly in mushrooms. It cannot be produced in the body and must be acquired through the diet or direct oral intake.

Cells of mammals, including humans, contain **transporter proteins** that specifically facilitate the transport of **L-ergothioneine** throughout the body.

This suggests that **L-ergothioneine** plays an essential role in the body, for cellular defenses and more.

L-ergothioneine shields against **DNA damage** from UV radiation and **telomere shortening** in cells under oxidative-stress conditions.

Through these actions, it may help slow the **aging** process and defend the body against age-related disorders, including **cardiovascular disease** and **cognitive decline**.

Observational studies have found that *higher* intake and blood levels of **L-ergothioneine** are associated with *reduced* rates of many age-related conditions and *increased* **life expectancy**.

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

In 2005, scientists made a striking discovery:

Human cells produce a **transporter protein** that serves largely as a **carrier** for one ***particular compound*** to cells throughout the body.

That *carrier* compound is:

L-ergothioneine.[4]

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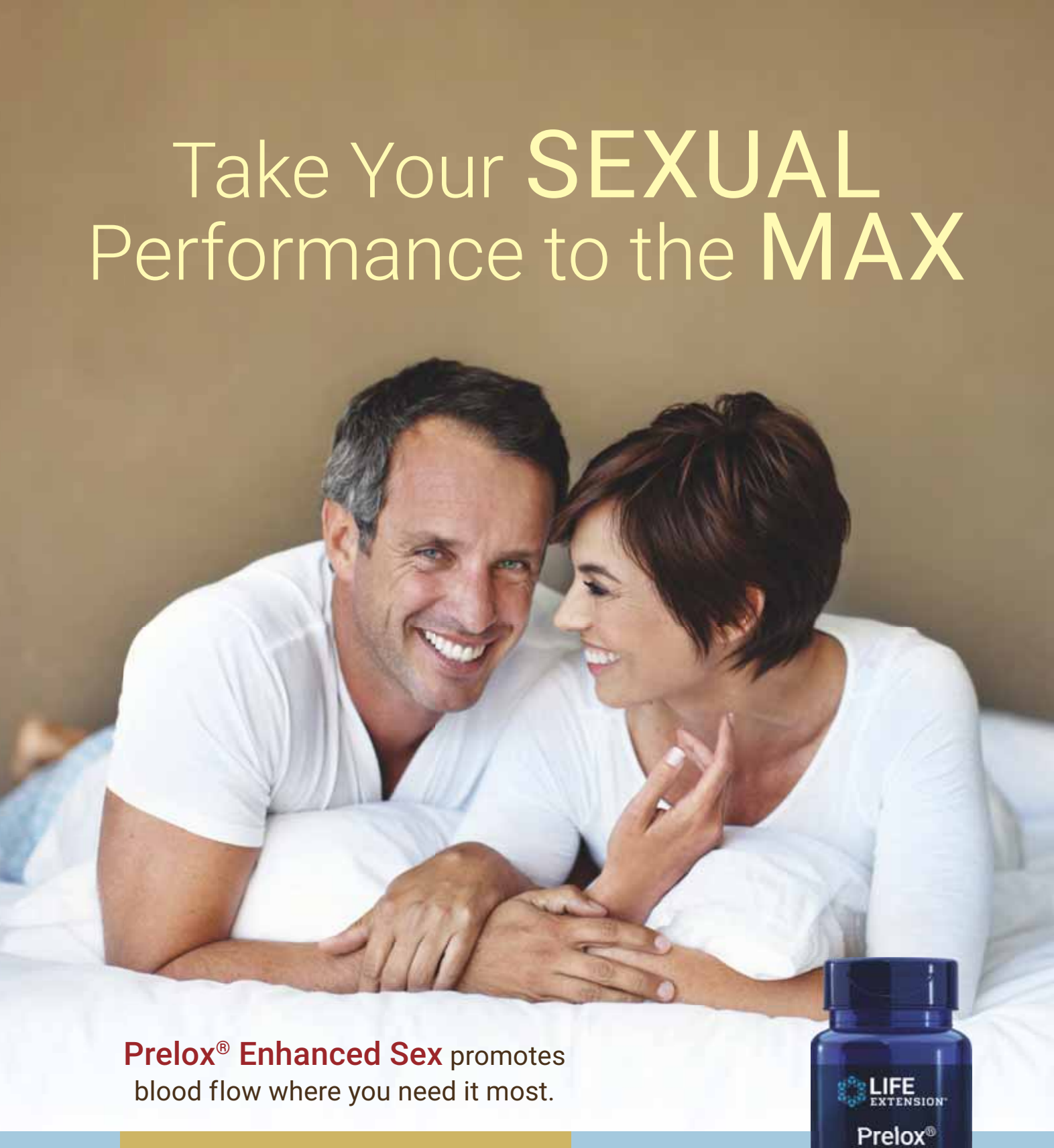

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The Mushroom 'Longevity' Amino Acid

L-ergothioneine is an amino acid found in **mushrooms**.

Studies suggest that **L-ergothioneine** may support healthy longevity by:

- Protecting against ***mitochondrial* DNA** damage[1]
- Delaying ***telomere*** shortening[2]
- Supporting **DNA function** in cells subjected to UV exposure[3]

One daily capsule of **Essential Youth** provides **5 mg** of **L-ergothioneine**.

This **5 mg** potency exceeds the ***L-ergothioneine*** contained in 2 cups of white button mushrooms, depending on growing conditions.[4,5]

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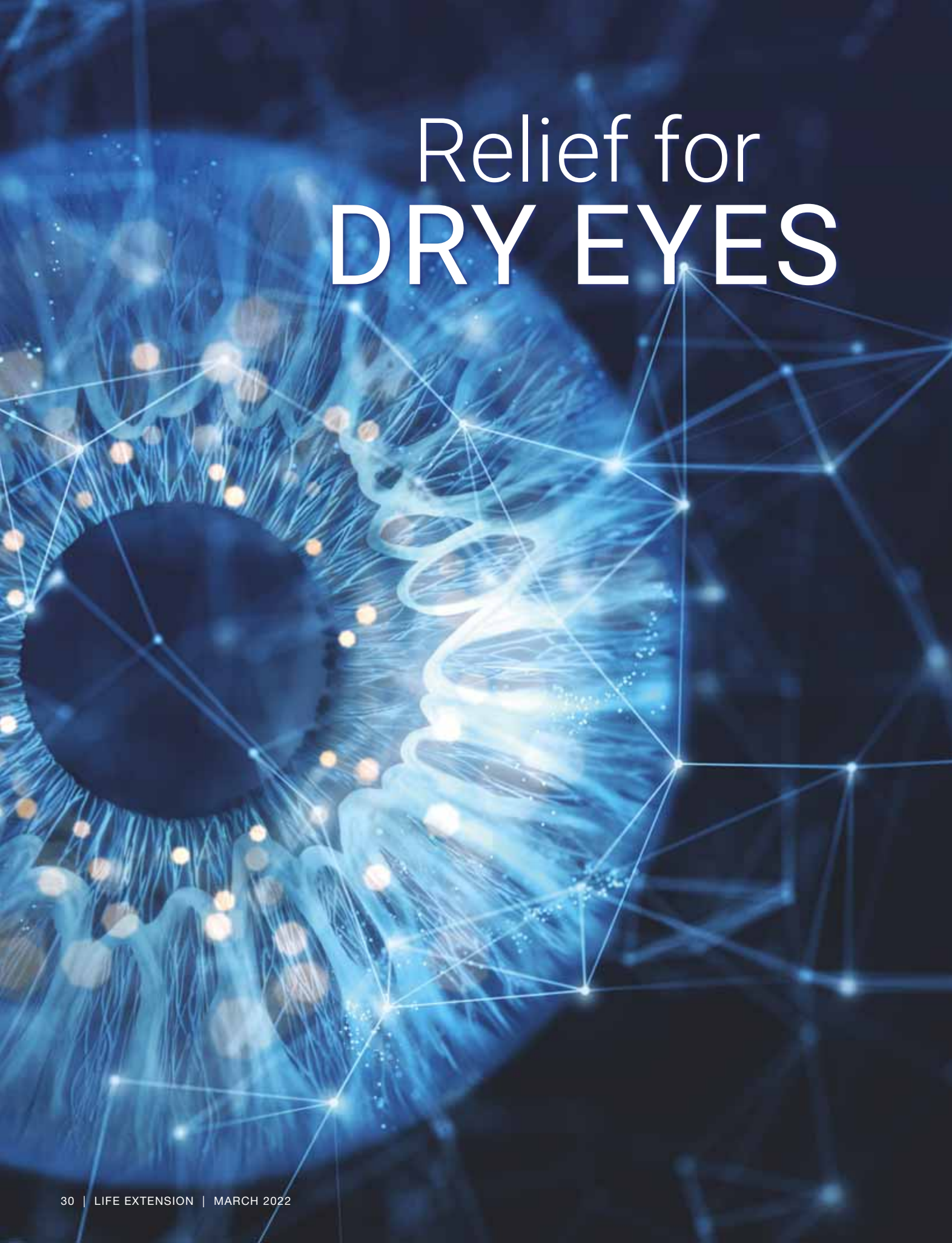


Relief for DRY EYES

BY MICHAEL DOWNEY

Dry eye syndrome affects up to **49 million** Americans.[1,2]

Widespread use of smart phones, tablets, computers, and other digital **screens** contributes to the condition.[3]

Left untreated, **dry eye** syndrome can lead to **permanent eye damage**.[4] It also can affect work productivity and contributes to automobile accidents.[3,5]

Over-the-counter eye drops provide **short-term** relief.[6] Prescription medications for dry eye syndrome can be very costly and have side effects including itching, stinging, burning, and redness.[7,8]

Scientists have identified a **berry extract** that, taken ***orally***, can boost the body's own production of **natural tears**.[9,10]

A pilot study showed that an oral extract of **maqui berry** provides a **72% improvement** in dry eye symptoms.[10]

A larger clinical trial confirmed that **maqui berry** increases tear production and reduces **eye dryness** and **eye fatigue**, delivering long-lasting effects.[11]

Discomfort and Eye Damage

Dry eyes are a daily annoyance for those who experience this problem. This includes stinging, itching, light sensitivity, difficulty focusing, and more.

Studies show that dry eye irritation is associated with lower scores on standard **mental health scales** and a **lower quality of life**.[12,13]

Without treatment, dry eyes can eventually cause **eye damage**.[4]

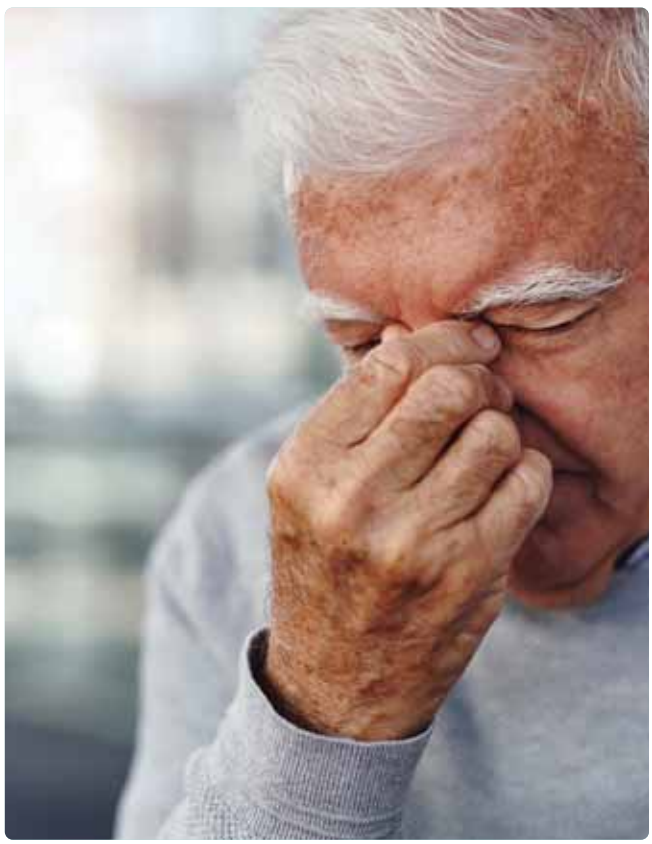
Tears are essential for lubricating and protecting the **cornea**, the front central surface of the eye. They protect the eye from infection, wash away foreign matter, and deliver critical nutrients to its surface.[14,15]

People suffering from **dry eye syndrome** often produce either *too few* tears or tears that are *poor quality*.[15,16]

As a result, the **cornea** can become damaged, and vision can become **impaired**.

Rates Are Rising

In addition to advancing age, the widespread use of devices such as smart phones, tablets, computers, and other screens may be a factor leading to increased dry eye symptoms.[3]



Use of these devices can result in a decreased blink rate and a fast rate of tear evaporation. Unfortunately for many, including children and young adults, screen time has increased multifold in recent years.

Other underlying causes of dry eyes include:[17]

- Environmental factors (pollution, wind, smoke, low humidity),
- Medications (antihistamines, antidepressants, anxiolytic drugs, estrogens),
- Wearing contact lenses,
- Cataract or vision-correcting surgery,
- Air conditioning,
- Hormone changes,
- Nutritional deficiencies (e.g., vitamin A deficiency).

Eye drops do not always deliver satisfactory relief and do not address the long-term risks of dry eyes. The reason is that it's virtually impossible to replicate the complex structure of **real tears**.

Why Real Tears Are Superior

Our natural tears are composed of:[14,15]

- An outer **oily** layer, which keeps tears from drying up too quickly,
- A middle **watery** layer, which wets and nourishes eye tissue, especially the cornea, which has no blood vessels, and
- An inner **mucus** layer, which helps the tear film stick to the eye surface and draw moisture into the cornea.

The health of the cornea and conjunctiva (the thin layer of protective tissue lining the eye) require tears to include all **three layers** and for *each* layer to have an adequate amount of these essential substances.

To relieve **dry eye syndrome** and nourish the eyes, scientists searched for a way to boost the body's *own* production of real tears.

WHAT YOU NEED TO KNOW

How Maqui Berry Works

Researchers found the solution in **maqui berries**, a fruit native to Chile and Argentina.

When taken **orally**, an extract of these berries *boosts* natural tear production.[9,10]

It delivers fast, lasting relief for dry and irritated eyes, which can help protect against long-term eye and vision damage.[10]

Maqui berries contain bioactive anthocyanidin pigments called **delphinidins**. Researchers found that these compounds:[9,19]

- Protect eye structures, including the tear-producing lacrimal gland, by reducing levels of **free radicals**,
- Inhibit damage from **light exposure** to the eye's delicate cells and tissues, such as the ***photoreceptor cells*** that convert light into signals sent to the brain, and
- Help restore the production of natural, high-quality tears.

In these ways, ***delphinidins*** can not only reduce damage to the **lacrimal glands**, which produce the **watery layer** of tears, but they also may help protect the cells of our eyes that are critical for vision.

Reversing Dry Eye Syndrome

- **Dry eye syndrome** causes daily discomfort and can increase the risk of infection and damage to the eye surface.
- Eye drops don't help long-term. Only ***real tears*** can fully nourish and protect the eye.
- Scientists have discovered that **maqui berry extract**, taken orally, dramatically boosts the body's own natural tear production.
- In a pilot study, this extract provided a **72% improvement** in dry eye symptoms in just two months.
- A controlled clinical trial confirmed that it **boosted tear production** by **89%** and reduced **eye discomfort** and **eye fatigue** in a matter of weeks.

In a rat model of dry eye, researchers suppressed the animals' ability to blink. This led to evaporation of tears and corneal damage. But in rats that were given the **maqui berry extract**, both the **loss of tears** and **corneal damage** were dramatically reduced.[9]

Impressive Results

In the pilot clinical study, scientists enlisted 13 volunteers with moderate eye dryness.[10] Participants took either **30 mg** or **60 mg** of **maqui berry extract** daily. This small study had no placebo group.

Eye dryness was evaluated using the **Schirmer's test**, which measures how much fluid is produced by the tear glands and whether it's sufficient to keep the eyes moist.

This study found that:[10]

- After 30 days, both dosage groups had about a **50% improvement** in tear production.
- After 60 days, the **30 mg** group's tear production slightly declined to a **26% improvement**, while the **60 mg** group continued to have about a **45% improvement** in tear production.

Subjects also completed a **Dry Eye-Related Quality-of-Life Score** test, which consists of questions about "bothersome ocular symptoms" and "impact on daily life."

A ***lower*** score means fewer problems and a ***better*** quality of life.

Scores for both groups substantially **improved** by 30 days after starting on **maqui berry extract**:[10]

Here are the results from dry eye sufferers who took two different doses of **maqui berry**:

- The **30 mg** group's score improved from **41** to **22** after **30 days** and dropped to **19** by **day 60**.
- The **60 mg** group's score improved from **40** to about **27** after **30 days** and continued dropping to an astoundingly low score of **11** by **day 60**.

A lower **Dry Eye-Related Score** reflects improved **quality of life**.

The group taking **60 mg** of the **maqui berry** had a **72%** improvement in dry eye symptoms after just ***two months***.[10]

Controlled Clinical Trial

Scientists next moved on to the gold standard type of human study, a **randomized**, **controlled trial**.

They enlisted 74 healthy participants (aged 30 to 60) who had moderate eye dryness and eye fatigue and were exposed to at least four hours of screen exposure daily. Both groups started with the same degree of eye dryness, measured again with the standardized Schirmer test.

Half the volunteers took **60 mg** of **maqui berry extract** daily, while the other half took a **placebo**. After **four weeks**, the Schirmer's test showed that the maqui group had significantly *higher* production of **tear fluid** in both eyes, with an average increase of **89%**.[11]

Results from the **Dry Eye-Related Quality-of-Life** questionnaire showed that the group taking the maqui berry extract had substantially improved values for ***ocular symptoms*** (such as grittiness or dry eyes), compared to the placebo group.

Participants also completed a **Visual Analog Scale** test, a test in which participants rate how much they agree with statements about their symptoms. Results showed that the maqui group experienced significant improvements in ***eye fatigue*** as well as ***stiff shoulders***, which often can occur with eye strain.[11]

This study confirmed that **maqui berry extract** delivers serious relief to those who suffer from dry eyes and related eye fatigue. In just weeks, it can boost quality of life. By improving tear production, the maqui berry also may help protect the eye from long-term damage.

Summary

Dry eye syndrome is an increasingly common condition that causes discomfort and can damage eye tissue.

A sufficient amount of high-quality **natural tears** is essential for protecting the eye from infection and delivering critical nutrients.

An oral extract of the **maqui berry** helps the body produce more of its *own* tears. It has been shown to relieve symptoms of dry eyes, including eye discomfort and fatigue, and to boost quality of life. •

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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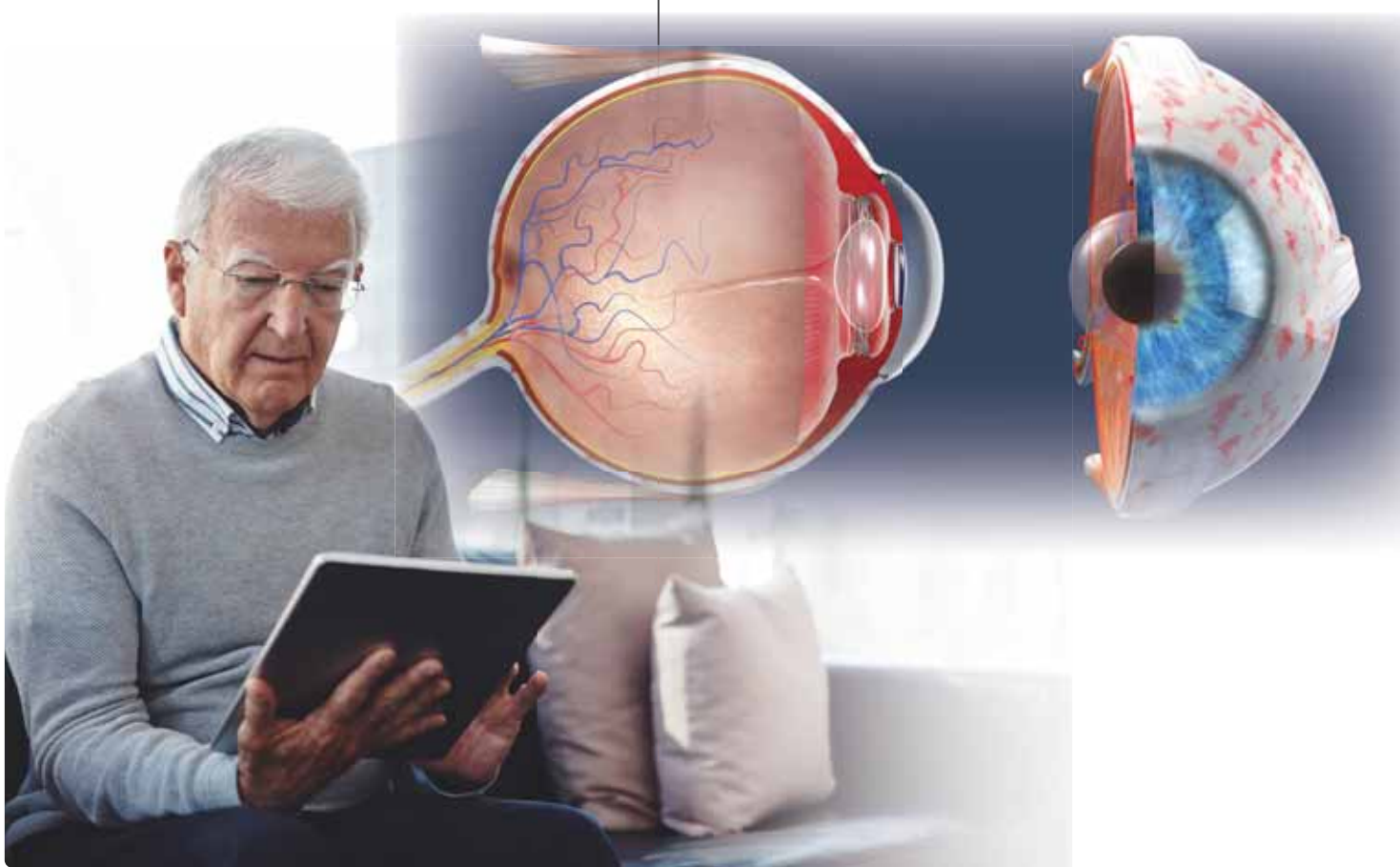

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VITAMIN
K2

Prevent Bone Loss *with* High-Dose Vitamin K2

BY MICHAEL DOWNEY

You slip and take what seems like a minor tumble—and feel pain and possibly hear a crack.

For adults over age 50, it's a shockingly common occurrence, and often the first sign they have the bone disease **osteoporosis**.[1]

About **50%** of American women and **25%** of American men over 50 will break a bone due to osteoporosis.[1]

Fractures are a leading cause of disability in older adults.

Within a year of suffering a **hip fracture**, more than ***20% of patients may die***.[2,3]

For decades, physicians in **Japan** have used **high doses** of **vitamin K2** to prevent bone loss and protect against **fractures**.[4]

Vitamin K2 is available in the U.S. at the same doses—*without* a prescription.

Clinical trials show that **45 mg (45,000 mcg)** of **vitamin K2** helps to:[5-10]

- **Slow bone loss,**
- **Reduce fracture risk, and**
- **Build new bone.**

A study of older **osteoporosis** patients showed that **high-dose** vitamin K2 cut the number of new vertebral **fractures** by more than **half**.[10]

Other nutrients taken with vitamin K2, such as **vitamin D** and **calcium**, provide further support for skeletal health.

Osteoporosis Increases Mortality Risk

The impact of osteoporosis-related **bone fractures** is staggering. After suffering one fracture, the risk of *future* fractures increases by a whopping ***86%***.[2]

Fractures of the **hip** and **vertebra**, in particular, are associated with loss of mobility and risk of death. People who suffer a **vertebral fracture** have an **eight-fold** increase in mortality compared to other individuals their age.[2]

But almost *any* kind of broken bone increases the risk of death in older people.[11] That's why it is imperative not just to slow, but to ***reverse*** bone loss as soon as it begins.

Creeping Bone Loss

When we're young, our bones are tightly packed with calcium and other minerals in an intricate structure that looks like a honeycomb.[1]

Even before age 40, **bone density** starts to ***decrease***.[12] This decline continues into old age. In women, the speed of bone loss accelerates with the onset of menopause.

This drop in bone-mineral density causes bones to become weak, brittle, and prone to **fractures**. Bone breaks may result from minor injuries. **Stress fractures** may even occur during normal movement.

The early stage of weakening bones is called **osteopenia**. As bone density continues to fall, **osteoporosis** develops. Osteoporosis means "***bone full of pores or holes***."

Suffering a fracture, especially if it occurs during normal movement, is when many people first discover they have **osteoporosis**.

The good news is that we can do something to prevent age-related bone loss and risk of fractures.

High-Dose Vitamin K2

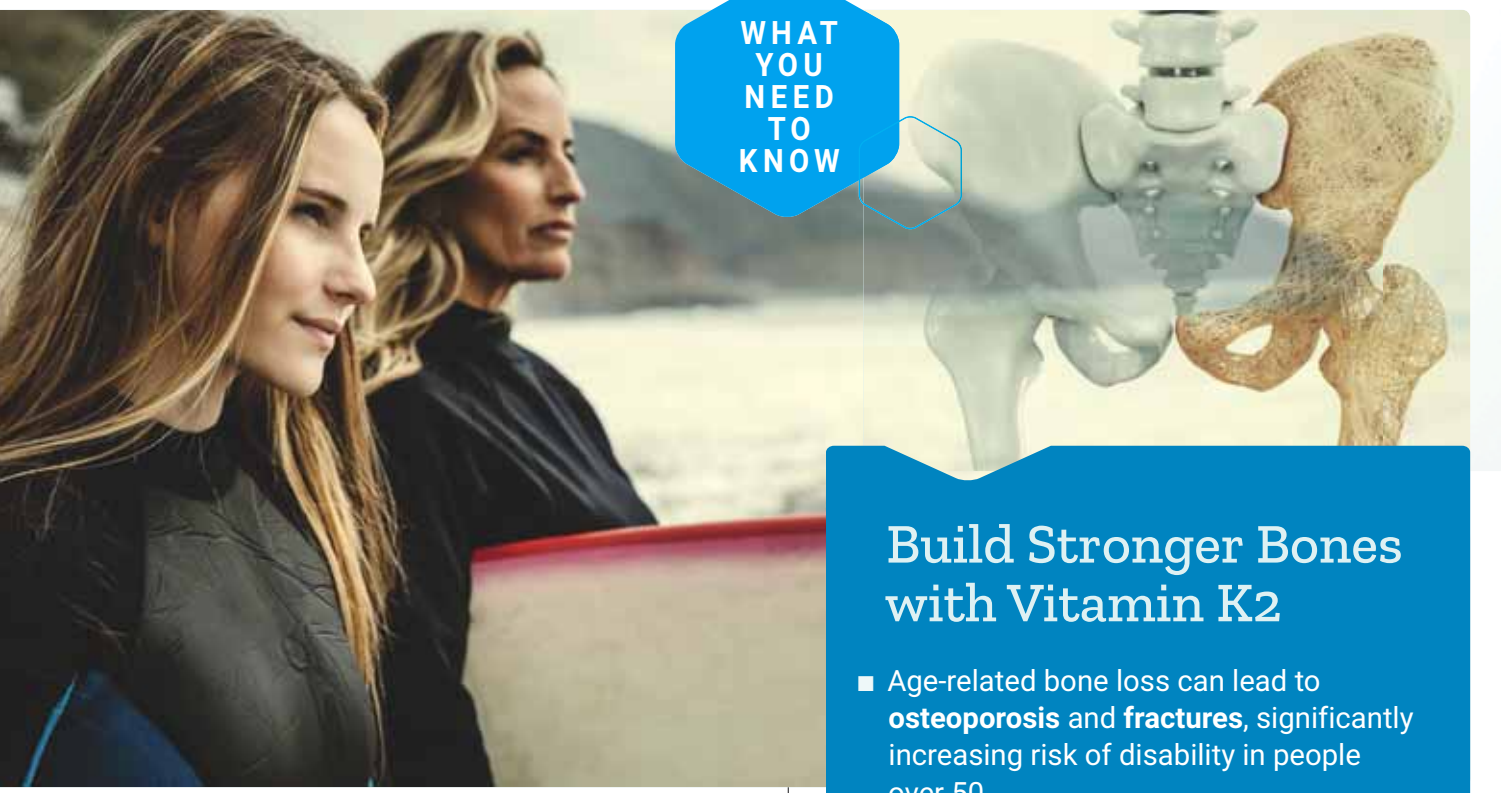
In *low* doses, vitamin K promotes normal blood clotting. This small amount of vitamin K is normally obtained from dietary sources.

But as far back as **1999**, scientists at **Life Extension** recognized that *higher* doses of vitamin K could better keep **calcium in bones** and help prevent **calcification** of soft tissues such as heart values, arteries, and brain cells.

It's important to understand that high doses of vitamin K do *not* cause greater coagulation.

Japanese doctors have long been treating **osteoporosis** by prescribing a specific form of **vitamin K2** called **menaquinone-4** (or **MK-4**), without any clotting issues.[7]

In high doses of ***45,000 mcg*** or **45 mg**, they have found that vitamin K2 safely improves bone health and helps prevent **fractures** in older adults.[5,6,8-10]



Boosting Bone Density

To study **vitamin K2** under the most challenging circumstances, scientists tested high doses on older people who had already developed **osteoporosis**.

In one study, Japanese researchers randomized older osteoporosis patients into two groups. One received **150 mg** a day of **calcium** alone. The other received the same calcium dose plus **45 mg** of **vitamin K2** (as **MK-4**) daily.[10]

Over a two-year period:[10]

- Patients who received only calcium continued to lose bone density in their lumbar spine, which dropped by about **3%**.
- Patients also receiving **45 mg** of vitamin K2 plus 150 mg of calcium maintained their bone mineral density.

That's a ***life-saving difference***.

A **10%** drop in bone density more than ***doubles*** the risk for **fractures** of the vertebra and hip.[13]

Patients in this study treated with calcium-only had an increased **risk of fracture**.

Adding **vitamin K2** largely arrested bone loss, reducing **fracture risk**.[10]

Build Stronger Bones with Vitamin K2

- Age-related bone loss can lead to **osteoporosis** and **fractures**, significantly increasing risk of disability in people over 50.
- **High-dose vitamin K2** (in the form of **MK-4**) has been used as a prescription treatment for osteoporosis in Japan for decades. These doses are available in the U.S. *without a prescription*.
- Vitamin K2 improves **bone health** by restoring balance to the process of bone breakdown and formation, favoring new bone growth.
- Human trials show that daily intake of **45 mg** of **vitamin K2** maintains or *increases* bone density while *reducing* fracture risk. In a two-year study on older adults with osteoporosis, it cut the number of new **vertebral** fractures by more than **half**.
- Other nutrients, including **calcium** and **vitamin D**, support bone health by other mechanisms and can be taken with vitamin K2.

Preventing Fractures

The same study also assessed the effect of **high-dose vitamin K2** on the incidence of bone **fractures**.

During the two-year study, the group receiving calcium alone sustained **35** fractures, compared to only **14** fractures in the vitamin K2 group.[10] And these study subjects were not treated with other critical bone supporting nutrients like **magnesium**, **boron**, and **vitamin D**.

In another clinical trial on postmenopausal women with **osteoporosis**, taking **45 mg** of oral vitamin K2 daily:[6]

- Maintained mineral **density** to a significantly greater degree than in control women, and
- Reduced the incidence of vertebral **fractures** to a degree similar to the drug etidronate.

Bisphosphonate drugs like risedronate (Actonel®) and alendronate (Fosamax®) are medications commonly used to treat **osteoporosis**.[14]

These medications are associated with various, though rare, side effects. These include osteonecrosis of the jaw, low blood calcium, reflux, ulcers, and more.[15,16]

Vitamin K2, on the other hand, is *not* associated with significant side effects, even at high doses.

How Vitamin K2 Keeps Bones Strong

Vitamin K2 works by restoring a healthy balance between the two types of bone cells that influence **bone density**.

Osteo*clasts* break down old bone, while **osteo*blasts*** build new bone. Healthy bone relies on a *balance* of activity between these two types of skeletal cells.

As we age, osteo*clast* activity begins to outstrip osteo*blast* activity. Bone is broken down faster than new bone is built up. Bone density drops and **osteopenia** and **osteoporosis** develop.

In preclinical studies, **vitamin K2** was shown to promote:[17,18]

- An increase in bone-building osteoblast activity, and
- A reduction in bone-destroying osteoclast activity.

With this balance restored, more bone is built, less is destroyed, and **bone mineral density** is maintained or even *increased*.

Additionally, in order to build bone, osteoblasts need a protein called **osteocalcin**. This protein binds to **calcium**, helping osteoblasts turn this mineral into healthy new bone. Vitamin K2 helps convert **osteocalcin** into its *active* form, which is required for its bone-building activities.[18,19]

In the Japanese study of older osteoporosis patients, the group receiving vitamin K2 had a significant *increase* in levels of **active osteocalcin,** which may be a mechanism by which the vitamin reduced fracture incidence.[10]

Vitamin K2 May *Enhance* Osteoporosis Drugs

Bisphosphonates are drugs prescribed to slow the bone loss of osteoporosis. They include medications such as **alendronate** (Fosamax®) and **risedronate** (Actonel®).

Vitamin K2 does *not* interfere with bisphosphonates and can safely be used at the same time.

Research even suggests that they may have an ***additive*** effect, protecting bone density better together than either one does alone.[17]

Nutrients That Support Vitamin K2

The powerful bone-rebuilding effects of vitamin K2 may be even greater when combined with other **nutrients** that support strong and healthy bones.

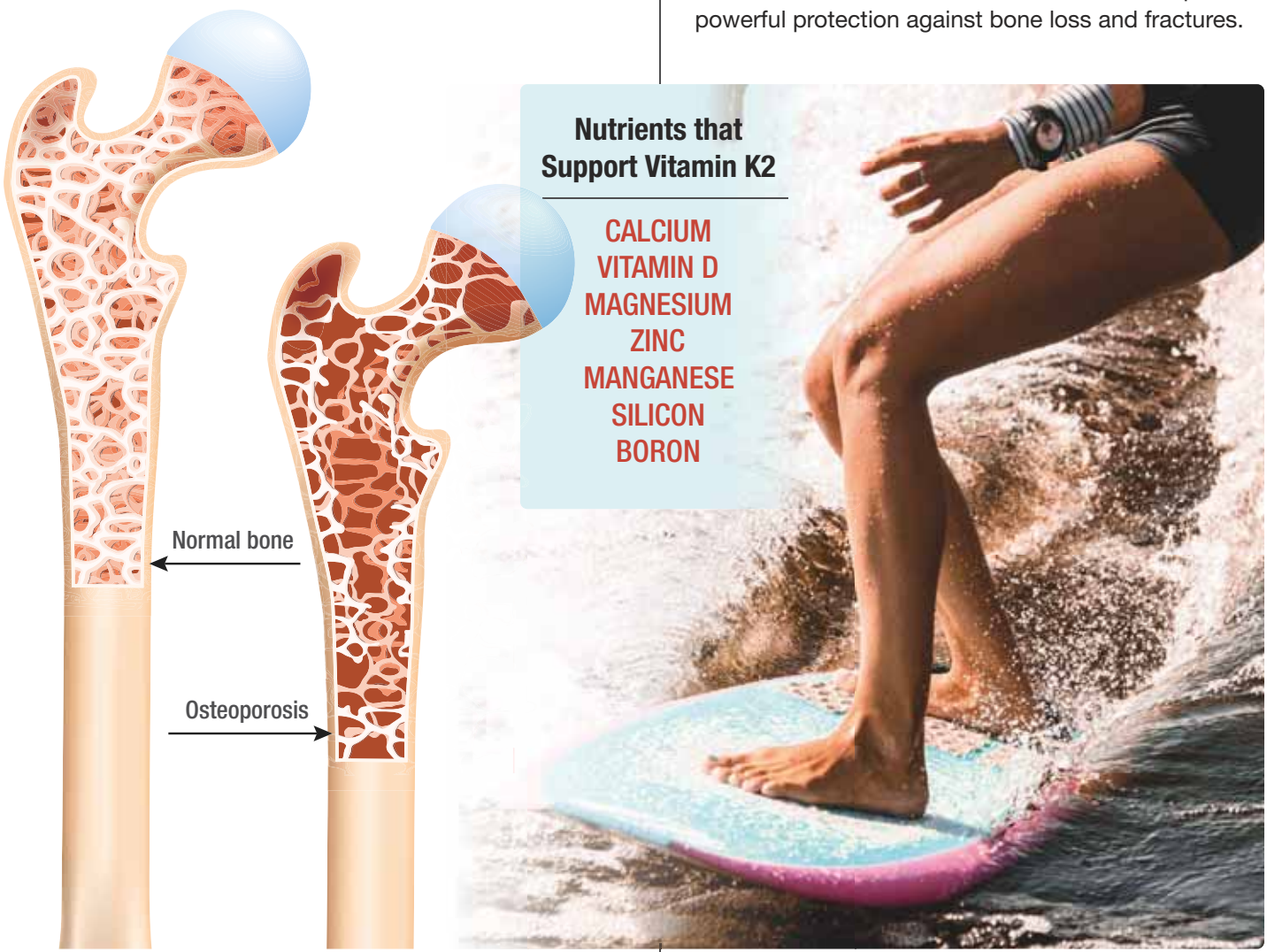
Calcium is the major mineral that forms the hard matrix of bone. Adequate calcium intake substantially *decreases* the rate at which bone breakdown and mineral loss occur.[20,21]

Vitamin D helps the body absorb calcium from the gut after a meal and stimulates the production of **osteocalcin**.[19] Research suggests vitamin D also facilitates the transfer of calcium to the bones, which may further support bone strength.[22]

Magnesium, like calcium, makes up the mineral matrix of bone and is needed to maintain healthy bone density.[23] About **half** of all magnesium in the body is stored in bone.[23]

Zinc, manganese, silicon, and **boron** are minerals that play important roles in optimal bone formation and health. *Low* levels of each of these minerals may contribute to bone *loss*, and increased intake improves bone health in animal and/or human studies.[24]

Taken with these nutrients, **vitamin K2** can provide powerful protection against bone loss and fractures.



Summary

As our bones become thinner and weaker with age, the risk of life-threatening **fractures** increases.

High-dose vitamin K2 has successfully and safely been used for decades in Japan to treat the bone disease **osteoporosis**.

Human trials demonstrate that daily intake of **45 mg** of vitamin K2 maintains or increases **bone-mineral density** and reduces the risk of **fractures**.

Along with other nutrients crucial for bone health, vitamin K2 can help build stronger, healthier bones. •

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

Vitamin K2 May Provide Cardiovascular Benefits

Vitamin K2 promotes new bone growth in part by increasing **calcification**, the buildup of calcium deposits, in the bone.

In soft tissues, however, **calcification** can be extremely dangerous. In blood vessels, it contributes to the buildup of atherosclerotic plaque associated with **cardiovascular disease**.

Research has shown that while vitamin K2 *causes* beneficial calcification in bones, it *prevents* harmful calcification in soft tissues, including blood vessels.[25,26] This occurs because it activates **matrix Gla protein**, which *inhibits* **calcification** of blood vessels.[27]

For this reason, vitamin K2 may be protective against cardiovascular disease.[26,28]

Vitamin K2 has been shown to be safe to use in healthy, older osteoporotic patients not taking oral **vitamin K antagonist** anticoagulants (**e.g. warfarin**), without having an adverse impact on clotting.[29]

Even studies with high doses of vitamin K have demonstrated its safety, without any adverse events.[7-9,30]

Still, anyone taking **warfarin**, a powerful anticoagulant, should consult a physician before taking *any* form of vitamin K.

Warfarin functions by blocking vitamin K activity in the body, which means warfarin users are to avoid vitamin K supplements and foods high in vitamin K. Newer drugs such as **Eliquis®**, **Pradaxa®**, and **Xarelto®** provide anticoagulant effects without the need to restrict vitamin K intake.

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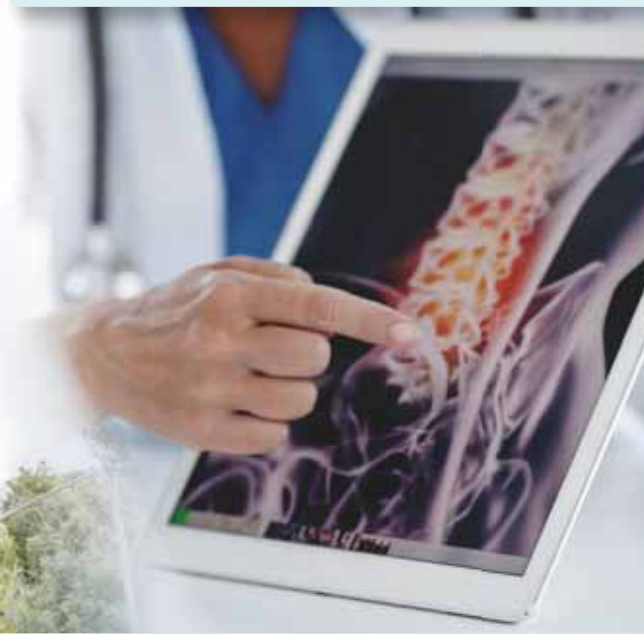
Medications That *Promote* Osteoporosis

Many common drugs can contribute to **osteoporosis** risk and bone loss, including:

- **Cancer-fighting drugs** that inhibit sex hormones, such as anti-androgen therapy (which reduces levels of testosterone) and aromatase inhibitors (which reduce estrogen activity).[31,32]
- **Corticosteroids** such as prednisone, hydrocortisone, dexamethasone, and many others.[33,34]
- **Warfarin** (Coumadin®), which is used to treat blood clots.[35,36]
- **Proton-pump inhibitors** such as Nexium®, Prilosec®, and Prevacid®, which are used to decrease stomach acid.[37,38]

Do *not* stop taking these drugs unless directed by your doctor. But people taking these medications may want to carefully monitor their bone mineral status.



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BY ERIC CORTEZ

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Another study found that having the *highest* omega-3 blood levels, compared to the lowest, was associated with a **34%** lower **risk of death** from *any* cause.[5]

For the past *four* decades **Life Extension** has educated consumers about the importance of consuming enough omega-3 fatty acids.

Recent data indicate the benefits exceed original expectations.

Omega-3 Fatty Acids in Diet

The two most important omega-3 fatty acids, **DHA** and **EPA**, are found primarily in **fish oil**.

The modern Western diet, which is heavy in beef, pork, and poultry, is extremely low in omega-3s.

At the same time, our diets tend to be very high in **omega-6 fatty acids**, which are found in many processed foods.

An excess of **omega-6** oils increases chronic **inflammation** throughout the body, accelerates the development of **atherosclerosis**, elevates risk for blood clots, and increases risk for **obesity**.[6,7]

Omega-3 fatty acids from fish oil and/or regular consumption of cold-water fish can help counter this omega-6 excess.

New Findings About Fish Oil and Lifespan

The **Framingham Heart Study** is one of the longest-running and most influential medical studies in history. Since it began in **1948**, it has followed thousands of people for decades and is now on its third generation of subjects.

Much of what modern medicine knows about the risk factors for **heart disease** has come from following Framingham study subjects.

The Framingham study, which has been extended by studying the children of the original participants, continues to be a valuable source of information about chronic disease and overall health.

In the past few years, two medical reports examined data on the Framingham offspring cohort and presented remarkable findings about the impact of **omega-3 fatty acids** on heart health and longevity.[4,5]

The first paper, published in **2018**, focused on the impact of the **omega-3 index** blood test on health outcomes.[5]

The **omega-3 index** is a measure of the percentage of total fats in red blood cells that are EPA and DHA. Prior studies have determined that an omega-3 index of around **8%** is optimal. Most people consuming a modern Western diet have a far lower omega-3 score.[8,9]

Researchers found that a *higher* **omega-3 index** was associated with a significantly *lower* risk of **all-cause mortality**.[5]

Having *more* omega-3s in the blood reduced non-cardiac and non-cancer causes of death, along with **cardiovascular events** like stroke and heart attack.

Compared to individuals with the lowest **omega-3 index** score, those with the *highe*st had:[5]

- A **34%** lower risk of **death from any cause**, and
- A **39%** lower rate of developing **cardiovascular disease**.

A more recent analysis, published in **2021** in the *American Journal of Clinical Nutrition*, found that the **omega-3 index** was as good at predicting **risk of death** during an **11-year** follow-up as age, smoking, blood pressure, diabetes, and other well-established risk factors.[4]

This study also found that having the *highest* blood levels of **omega-3** fatty acids, compared to the lowest, was associated with increases in **life expectancy** of **4.7 years.**

Whole-Body Health

Most people associate **omega-3 fatty acids** with **heart health**.

There's good reason for that. Published data support *higher* intake of omega-3 for both the prevention and management of **cardiovascular conditions**.[10-16]

Higher levels of the omega-3 index *and* regular intake of omega-3s have both been found to reduce risk of **cardiovascular events** like heart attack and stroke, and to reduce **mortality** from heart disease.[15,17,18]

Beyond heart health, maintaining high levels of **omega-3s** contributes to a healthier and longer life.

The following pages describe some of the ways that omega-3s favorably impact longevity.

WHAT YOU NEED TO KNOW

Omega-3s Promote a Longer, Healthier Life

- The fish-oil-derived **omega-3 fatty acids** DHA and EPA are vital nutrients that impact many aspects of health.
- *Higher* blood levels of omega-3 fatty acids are associated with improved **brain** and **cardiovascular health**, along with reductions in chronic **inflammation**.
- Recently published analyses from the Framingham Heart Study offspring cohort found links between omega-3 levels and **longevity**.
- These reports show that the **highest** levels of omega-3 fatty acids, compared with the lowest, were associated with a **34%** lower risk of **dying from any cause** and with increases in **life expectancy** by almost ***five years***.
- The highest levels of omega-3s in the blood were also associated with a **39%** lower rate of developing **cardiovascular disease**.

Omega-3 Index Complete At-Home Finger Stick Test

The **Omega-3 Index Complete** test evaluates your omega-3 index, trans fat index, omega-6: omega-3 ratio, arachidonic acid: EPA ratio, and also includes a full fatty acid profile.

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Metabolic Health

Elevated **triglycerides** are associated with metabolic disturbances that increase heart attack and ischemic stroke risk.[19]

Increased cardiovascular risks are also associated with **small-dense LDL particles**,[20] **very low density lipoproteins** (VLDL),[21] and **remnant lipoprotein particles**.[22] These are all known promoters of **atherosclerosis**.[23-25] Supplementation with **fish oil** has positive effects on these and other markers of cardiovascular risk.[26-30]

Fish oil lowers **triglycerides** and other atherosclerosis-inducing **lipoproteins** by:[31-35]

- Increasing the clearance of triglyceride-rich lipoproteins from the bloodstream,
- Decreasing the liver's production and secretion of triglyceride-rich lipoproteins, and
- Increasing the activity of lipoprotein lipase, which breaks down triglycerides so the body's tissues can use the fatty acids.

Life Extension considers optimal fasting triglyceride levels to be below **100 mg/dL**. Individuals at high risk for cardiovascular events should strive for even *lower* levels.

Brain Health

Omega-3 fatty acids play a critical role in the **brain**.

One reason is that they are a key component of brain cell membranes.

Brain cell membranes generate and conduct the electrical *signals* that play a role in everything from simple movement, to language, reasoning, and memory formation and recall.

These *signals* cannot be conducted properly without myelin, which insulates the fibers of nerve cells.[31] **Myelin sheaths** that cover nerve fibers require **omega-3s** to function optimally.[37]

Omega-3 intake also impacts levels of **brain growth factors** that support the survival, development, and adaptability of neurons.[38-41]

One study in an animal model of **Alzheimer's disease** found that even short-term **omega-3** intake improved the function of brain cells in animals that had not yet developed dementia symptoms.[42]

Mental Health

The benefits of omega-3s in the brain extend to mental health. Studies show that lower fish oil or omega-3 intake is associated with a greater prevalence of **depression**.[41,43-45]

In a **2020** study, pregnant women—who are at risk for post-partum depression—were randomized to take either omega-3 fatty acids (containing **1,206 mg** EPA and **609 mg** DHA) or a **placebo**.[46] Those taking the fish oil saw a decrease in symptoms of **depression**, while no change was observed in the **placebo** group.

Chronic Inflammation

Chronic inflammation drives nearly all forms of chronic disease, including cancer, obesity, diabetes, cardiovascular disease, cognitive decline, and dementia.

Maintaining a healthy level of omega-3 fatty acids in the body can reduce and help **resolve** chronic inflammation.[6,7,47] That can help lower risk for most age-related chronic illnesses.

Summary

Omega-3 fatty acids are vital for whole-body health.

The most abundant and efficient way to deliver them into your body is through **fish oil**.

The vast majority of Americans have inadequate intake of these healthy oils in their diet.

Numerous studies show a correlation between *higher* levels of omega-3 fatty acids in the body and better health. Other studies show that a high daily dose of **fish oil** can improve a variety of health outcomes.

A recent report links *higher* omega-3 levels in the blood with a **4.7-year increase in life expectancy**. ●

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

Importance of Omega-3 Testing

The best way to know for sure if you are getting enough **omega-3** fatty acids is to test your blood levels. The **Omega-3 Index** is a blood test that can measure the **percent** of omega-3 fatty acids in red blood cells.

Omega-3 testing is easy with a simple at-home finger stick test.

Ideally, your **Omega-3-Index** score should be *greater than* **6.8%**

One dose-response study estimated that it would take about **1,300 mg** of added **EPA/DHA** from fish or supplements to increase the **omega-3 index** from *less than* **4.2%** to *greater than* **6.8%**.[48]

An analysis from the Framingham offspring cohort reveals a red blood cell **omega-3 index** over **6.8%** is associated with **4.7 years** additional **life expectancy** compared with an **omega-3 index** under **4.2%**.[4]

In another study, people with **omega-3** scores *greater than* **6.8%** compared with those *less than* **4.2%** have:[5]

- **39%** lower risk for **cardiovascular** disease
- **34%** lower risk of **death** from *any* cause

The typical Japanese omega-3 index is greater than **8.0%** and that may correlate with a **five-year** *longer* life expectancy in **Japan**.[4]

To order the at-home **Omega -3 Index** test, call **1-800-544-4440** or visit **www.LifeExtension.com**

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1. *Sleep Med*. 2020;72:28-36.

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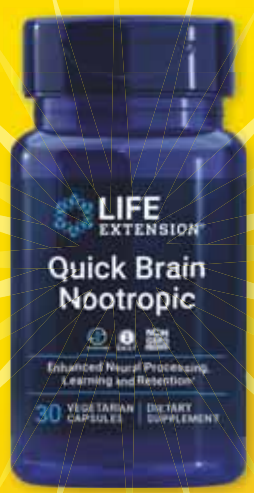

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NAC Reduces Brain Aging

BY JUDITH SAUER

NAC, or **N-acetyl-L-cysteine**, is an amino acid that has become popular because of its ability to reduce respiratory illness and improve **immunity**.[1-4]

Researchers have discovered that **NAC** is also beneficial for **brain health**.

NAC accomplishes this by helping the body produce **glutathione**, a potent antioxidant.

With age, declining **glutathione** levels may accelerate the progression of neurodegenerative disorders.[5,6]

Using advanced brain **imaging** technology, scientists found that even a single-dose infusion of NAC ***significantly increased*** levels of **glutathione** in healthy individuals *and* those with chronic conditions.[7]

NAC has been shown in other studies to help **protect brain function** into older age and potentially reduce risk for neurodegenerative conditions.[8]

Glutathione and Brain Aging

Glutathione levels drop with advancing age.[5]

This leaves tissues vulnerable to oxidative stress and the development of chronic disease conditions.

The process is a vicious cycle.

As glutathione levels drop, the brain's defenses weaken. It becomes more susceptible to oxidative injury. Higher levels of oxidative stress contribute to the progression of cognitive dysfunction.[9]

Autopsy studies show that patients with **mild cognitive impairment** and **Alzheimer's disease** have depleted **glutathione** levels in certain areas of the brain.[10]

Decreased glutathione has been observed in other conditions such as **Parkinson's disease**, **schizophrenia**, **bipolar disorder**, and even **major depression**.[11-15]

Studies show that **NAC** is an effective way to boost **glutathione** levels in the body.[8]

NAC Boosts Glutathione

N-acetyl-L-cysteine (NAC) is a compound that can replenish cellular glutathione levels.

Animal and human studies show that **NAC** can increase levels of glutathione in the **brain**.[7,8,14,16]

One human study used **magnetic resonance spectroscopy**, an imaging technology that is able to determine the concentrations of specific compounds in the brain of a living human.[7]

It showed that a single infusion of **NAC** led to an *increase* in **brain glutathione** from baseline, averaging an approximately **43%** increase among all participants. The increase was greatest (averaging **55%**) in subjects with **Parkinson's disease**.

Whole-body blood antioxidant status was also significantly improved.

Maintaining glutathione levels into older age may help reduce the risk of age-related conditions caused by **oxidative damage**.[6]

Modulating Neurotransmitter Systems

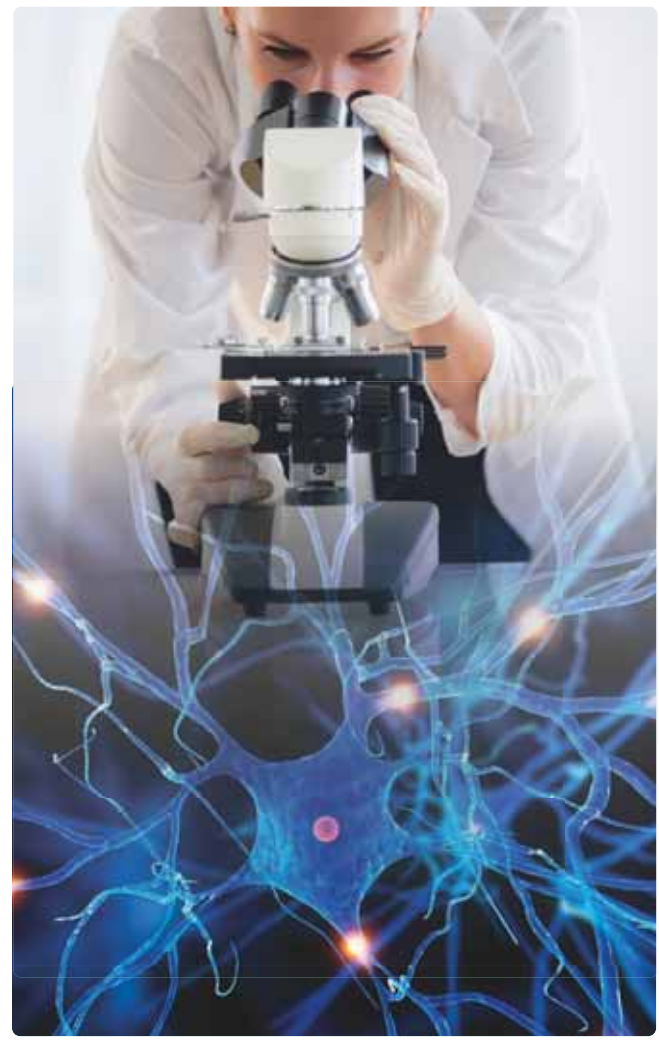
Abnormalities of certain **neurotransmitters** can lead to the development of several conditions of the brain, from addiction to schizophrenia. **N-acetyl-L-cysteine** (NAC) has been found to have a beneficial impact on some of these neurotransmitters and their activity.[8]

For example, **glutamate** is the most abundant excitatory neurotransmitter in the brain. It plays vital roles in cognition, learning, memory, and more. But problems with improper glutamate neurotransmission occur in several disorders of the nervous system.

One of the most important glutamate receptors, the **NMDA receptor**, has been shown in animals to have a binding site for glutathione.[17-19] By *increasing* glutathione levels, and via other mechanisms, **NAC** may help normalize the function of this **glutamate receptor** and *improve* the balance of glutamate *signaling*.[8]

In animal models of **schizophrenia**, NAC helps balance glutamate systems in the brain, improving symptoms of the disease.[20]

Because of these actions, **NAC** is being actively studied and shows promise in helping treat various neurological and neuropsychiatric conditions in humans.[8,21-24]



WHAT YOU NEED TO KNOW

Protect the Brain with NAC

- **N-acetyl-L-cysteine (NAC)** is a nutrient that can be used by the body as a precursor in the synthesis of new glutathione.
- **Glutathione** levels tend to drop with age.
- Low levels of glutathione are seen in the brains of those suffering from **cognitive decline** and **dementia**, as well as various other chronic conditions of the nervous system.
- Brain scanning technology in humans has shown that NAC use boosts the production of glutathione in the brain, shielding against oxidative damage.
- Studies have found that NAC acts by various other mechanisms to protect the brain, including lowering levels of harmful **homocysteine** and modulating **neurotransmitter** systems.
- Human trials of NAC for dementia and other neuropsychiatric conditions are currently in progress. In **animal** studies, NAC has shown benefits in models of accelerated aging, Alzheimer's disease, stroke, and Parkinson's disease.

Reducing Homocysteine Levels

Boosting glutathione isn't the only way NAC can help maintain brain health. It can also lower potentially dangerous levels of the amino acid **homocysteine**.[25,26]

Elevated levels of homocysteine are a risk factor for the development of cardiovascular disease and stroke. Research has revealed that high homocysteine is also a risk factor for **cognitive decline** and **dementia**.[27-29]

In **2018**, a group of experts put out an **International Consensus Statement** declaring that elevated homocysteine is a **modifiable risk factor** for cognitive decline, dementia, and Alzheimer's disease in older adults.[29]

Modifiable risk means that its levels can be changed by intervention and that this action may lower risk for these conditions.

Elevated homocysteine levels are common in older age.[27] The good news is that oral **NAC** intake has clearly been shown to help reduce **homocysteine** levels in several clinical trials.[25,26,30,31]

The dose of NAC used in these studies varied from **600 mg** to **4,000 mg** per day. All dosages led to a significant decline in homocysteine levels.[25,26,30,31] Higher doses led to greater reductions, up to as much as a **50%** reduction.[30]

Trials of NAC for Disorders of the Brain

The use of NAC has shown clear benefits in several animal models of brain disease. Some examples include:

- Improved **cognition** in a mouse model of accelerated aging,[16]
- Prevention of learning/memory impairment in mouse models of **Alzheimer's disease**,[32,33]
- Up to a **50%** reduction in stroke infarct size along with a similar improvement in neurological function in rodent models of **stroke**,[34-36]
- Significantly reducing motor dysfunction in a rat model of **Parkinson's disease.**[37]

Studies in roundworms show that NAC can **extend lifespan**.[38,39]

Human trials of NAC for brain-related conditions from dementia to psychiatric disorders are currently underway.

But there are already some early signs that using **NAC** to increase brain levels of **glutathione** may translate into improvements in symptoms of brain disease.

For example, one study looked at the use of NAC in the early stages of probable **Alzheimer's** disease.[40] It found that there was a significant improvement in brain executive functioning, such as **verbal fluency**.

This is an especially promising finding since lower verbal fluency at diagnosis has been shown to be predictive of death in Alzheimer's patients.[41]

Studies also suggest that NAC can be useful in the management of various psychiatric conditions, including schizophrenia, substance abuse disorders, autism, depression, and obsessive-compulsive disorder.[22,23]

The results of human trials of NAC are expected to be released in coming years, but preliminary studies show that it has the potential to help maintain brain health well into older age.

Summary

Glutathione levels drop with age.

Research shows that patients with mild cognitive impairment and Alzheimer's disease have lower glutathione levels in certain areas of the brain.

N-acetyl-L-cysteine (NAC) has been shown in both animal and human studies to boost glutathione levels.

By increasing glutathione, reducing homocysteine, and modulating neurotransmitter systems, NAC holds promise in **reducing brain aging**, maintaining brain health into older age, and managing various brain-related conditions. •

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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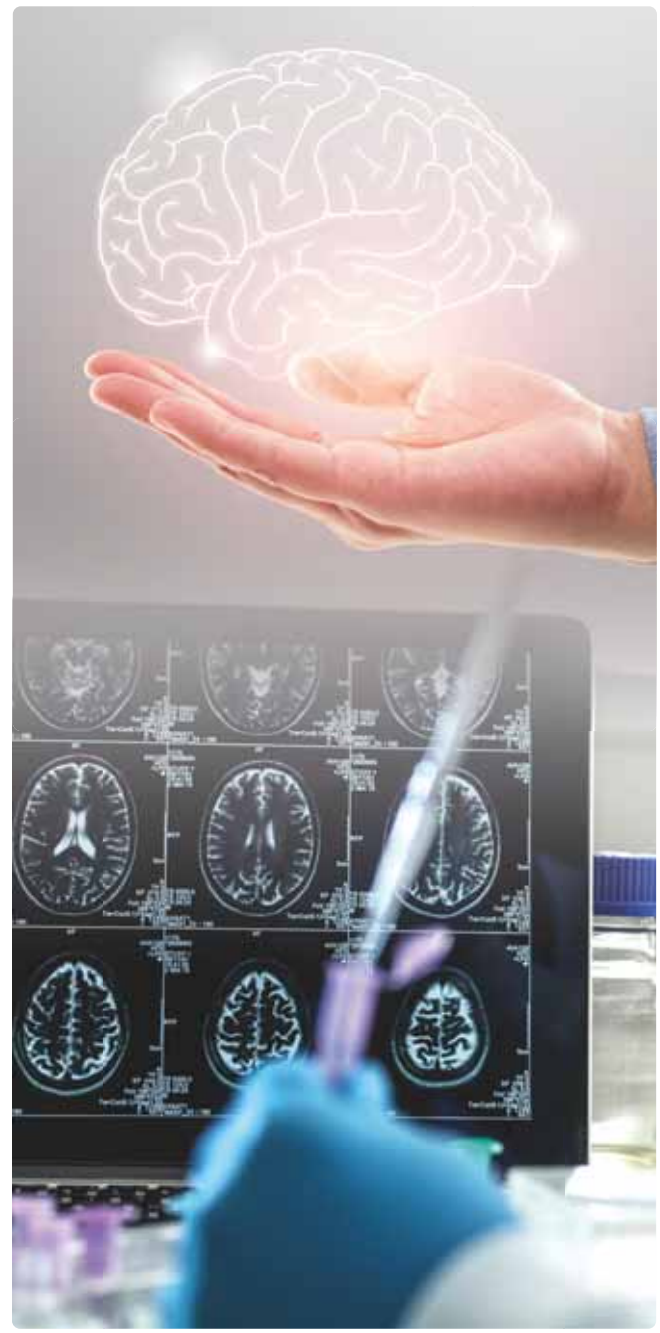

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The Prospect of Human Age Reversal

By William Faloon

Each year there are scientific conferences where presentations are made about slowing and reversing aging processes in lab models and people.

Groups that I fund send experts to many of these events to learn better ways of keeping people alive and healthy for as long as possible.

I announce these findings at a conference that **Life Extension** helps sponsor called **RAADfest**, which stands for **Revolution Against Aging and Death**.

Each year, about 1,000 people attend this event where speakers describe mechanistic ways for people to thwart degenerative processes.

This article summarizes highlights from my keynote presentation at **RAADfest 2021**.

My presentation opens by outlining the major topics I will discuss, as can be seen on the following slide.

Transcending Toward Super Longevity

TODAY'S OVERVIEW

- **Research findings since last year's RAADfest.**
- **What people can do now to live 5 more years.**
- **Repopulate bone marrow with autologous stem cells to reverse immune senescence.**
- **Transhumanist advances over last few months.**

I let the audience know that ***Life Extension***® has been publishing groundbreaking research findings for the past **41 years** in our monthly publications:

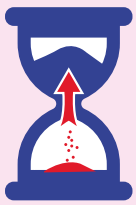
41 Consecutive Years of Monthly Publication

(470,000 copies mailed last month)

1980-1986 Anti-Aging News
1986-1994 Life Extension Report
1994-2021 *Life Extension Magazine*®

Our contention that aging may be reversible today is controversial. I make it clear that we nonetheless proceed forward no matter what obstacles stand in our way.

Our Controversial Contention



IT MAY BE POSSIBLE
to Reverse Human Aging

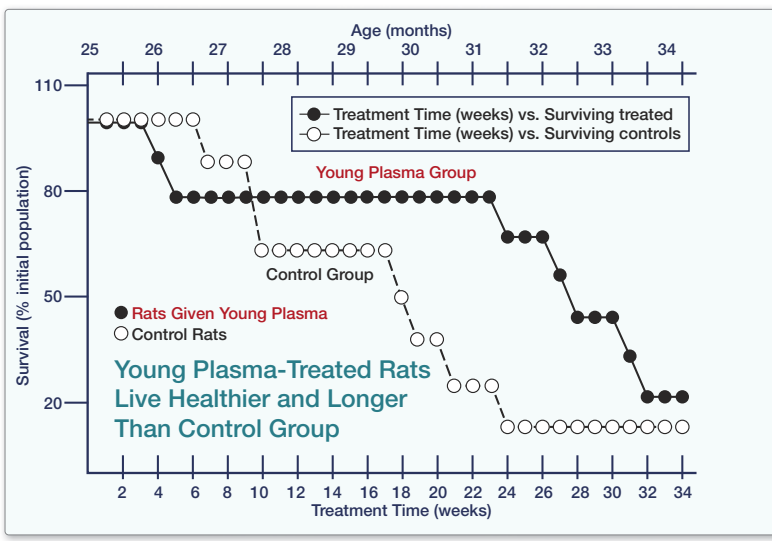
Most attendees at these conferences are aware of **research** dating back to the 1950s showing that when **young blood** is continually circulated into old animals, the old animals grow biologically ***younger***.

What's important about this research is that it proves a concept, i.e., it is possible to partially **regenerate** old animals.

My first announcement was a study our groups funded showing that injecting **young plasma** into rats the **human** equivalent of **60 years** enabled quality-of-life enhancements and some longevity benefits.

The **young plasma**-treated rats looked and behaved *younger* than the same age control group.

The slide below shows that rats given **young plasma** (solid black dots) lived much longer before degenerative changes set in compared to the **control** group (blank circle dots).



May 28, 2021 Young Blood Plasma Extending Rats Max Lifespan, Professor Rodolfo Goya's Experiment Update Posted by Montie Adkins

The **young plasma**-treated rats may have lived seven additional human equivalent years compared to the control groups. I acknowledged that calculating **human equivalents** to rodent lab models is an imprecise science.

The box below summarizes highlights from this **young plasma** study that our groups helped to fund:

Survival + Quality-of-Life Improvements in Rats Receiving Young Plasma (i.p.) Every 2 Weeks

- Rats aged human equivalent of 60 years given Young Plasma via intraperitoneal injection.
- Transient improvement in quality of life.
- Average Lifespan of untreated group: 29.8 months (70 years in humans)
- Average Lifespan of treated group: 32 months (77 years in humans)
- On May 23, 2021, seven treated rats alive compared to one living control.
- On July 20, 2021, two treated rats alive compared to one living control.

Email from Professor Rodolfo Goya to Bill Faloon August 16, 2021.

I reminded the audience of a separate study where a **young plasma fraction** cut a measure of aging in half in old rats. This was calculated by **epigenic age** using the "Horvath Clock." The Horvath Clock is the most reliable current measure of biological age, and this study is described on the following three slides:

bioRxiv
April 21, 2020

Young Plasma Fraction Induces Age Reversal in Major Tissues

Young plasma treatment more than halved the epigenetic ages of blood, heart, and liver tissues.

Epigenetic clock measures indicate systemic rejuvenation.

Horvath, S., Singh, K., Raj, K., Khairnar, S., Sanghavi, A., Shrivastava, A., … & Lehmann, M. (2020). Reversing Age: dual species measurement of epigenetic age with a single clock. bioRxiv.

bioRxiv
April 21, 2020

Rejuvenating Effect on Grip Strength in Old Rats

Within 10 days of **young plasma fraction** treatment the physical capabilities of **old rats** are indistinguishable from that of the **young rats.**

Horvath, S., Singh, K., Raj, K., Khairnar, S., Sanghavi, A., Shrivastava, A., … & Lehmann, M. (2020). Reversing Age: dual species measurement of epigenetic age with a single clock. bioRxiv.

DNA Methylation Measures Epigenetic Age

DNA methylation controls the transcription (activation) of genes.

Without proper DNA methylation beneficial genes are deactivated while harmful genes can be overexpressed.

This is the principle of what is called "epigenetic aging."

Young plasma treatment more than halved epigenetic ages.

Horvath, S., Singh, K., Raj, K., Khairnar, S., Sanghavi, A., Shrivastava, A., … & Lehmann, M. (2020). Reversing Age: dual species measurement of epigenetic age with a single clock. bioRxiv.

My emphasis was on the **consistency of evidence** about **rejuvenating** factors in **young plasma.** I let the audience know our challenge in the box below:

"How to Transition Young Plasma Benefits into Old Humans?"

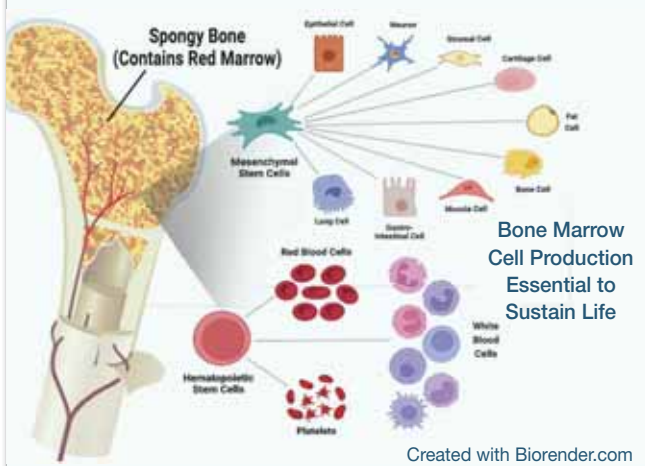
The proposed solution as described in the following slides is to use "***transcription factors***" to "turn on" *youthful* **gene expression** in human **bone marrow**.

This may enable our own bone marrow to generate endless supplies of youthful blood cells (including stem, progenitor and immune cells) to induce **systemic age reversal** and keep us young.

Transcription factors are cellular proteins that turn our **genes** "on" and "off" so that genes are expressed in the right cell, at the right time, in the right amount.

The following five slides describe the importance of healthy bone marrow, how exhaustion of **bone marrow stem cells** limits lifespans, and how ***transcription factors*** (including Yamanaka Factors) were proven two decades ago to reverse aging in old cells.

Bone Marrow Yields Regenerative Stem Cells



Bone Marrow Cell Production Essential to Sustain Life

Created with Biorender.com

The Nobel Prize in Physiology or Medicine

"For the discovery that mature cells can be reprogrammed to become pluripotent."

Four specific genes encode *transcription factors* that can convert somatic cells into pluripotent stem cells that can propagate indefinitely.

These transcription factors are collectively called:

"Yamanaka Factors"

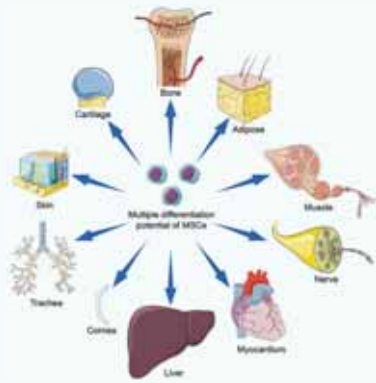
The Nobel Prize was awarded to John B. Gordon and Shinya Yamanaka—two scientists who discovered that mature, specialized cells can be reprogrammed to become embryonic cells capable of developing into all tissues of the body.

https://www.nobelprize.org/prizes/medicine/2012/yamanaka/facts/

Stem Cells Naturally Enable Systemic Rejuvenation

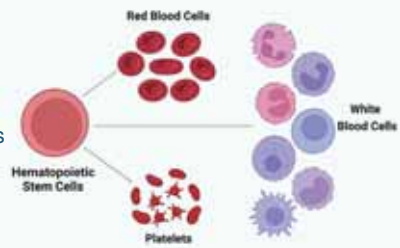
But our supply of hematopoietic and mesenchymal stem cells is limited.

Transcription factors can reprogram old cells into induced pluripotent **stem cells** that can theoretically regenerate our tissues forever.



Hematopoietic Stem Cells

can develop into all types of blood cells and are found in peripheral blood and bone marrow.



With age, hematopoietic stem cells become depleted and contribute to **immune senescence** and anemia.

Healthy hematopoietic stem cells are needed to sustain life.

https://www.cancer.gov/publications/dictionaries/cancer-terms/def/hematopoietic-stem-cell

Lund University February 2017 How Blood Can Be Rejuvenated

- Blood stem cells generate around a thousand billion new blood cells every day.
- The capacity of hematopoietic stem cells to produce new blood cells diminishes with age.
- Older people are more susceptible to anemia, lowered immunity, and blood cancers.
- Researchers at Lund University (Sweden) rejuvenate blood stem cells in aged mice.

"We found that there was no difference in blood-generating capacity when we compared the reprogrammed blood stem cells with healthy blood stem cells from a young mouse. This is, as far as we know, the first time someone has directly succeeded in proving that it is possible to recreate the function of young stem cells from a functionally old cell."

Wahlestedt, M. et al. Clonal reversal of ageing-associated stem cell lineage bias via a pluripotent intermediate. Nat. Commun. 8, 14533 doi: 10.1038/ncomms14533 (2017).

I then announced a review article that we **funded** that was published in **February 2021** in a respected scientific journal. The purpose of this article was to summarize data that began accumulating in **2006** showing that it is possible to fully reverse **aging** in old cells using ***transcription factors*** to turn *youthful* **gene expression** back on.

Authors of this review discuss several studies, including one demonstrating that cells from **100-year-old** people can be "**reprogrammed**" into induced pluripotent **stem cells**.

The next step in transitioning this science to **whole-body regeneration** is to **multiply** the reprogrammed **stem cells** (genetically identical to the donor host) and then transplant the **reprogrammed** stem cells back into the same donor. The objective is **systemic rejuvenation**.

By highlighting key findings from eight independent studies, this review article (published **February 28, 2021**) urged that this technology be transitioned into whole-animal studies and then **people** if the animals safely grow biologically *younger*.

National Library of Medicine February 28, 2021

"Aging and Rejuvenation – A Modular Epigenome Model"

"When cells were reprogrammed with a 6-factor cocktail the (degenerative) alterations were fully reversed and cells fully rejuvenated."

- This 2021 published review and additional investigations summarize age-reversal impact of cell reprogramming.
- Human trials being investigated.
- Funded by Bill Faloon and other charitable donors.

Chiavellini P, Canatelli-Mallat M, Lehmann M, et al. Aging and rejuvenation—a modular epigenome model. Aging (Albany NY). 2021;13(4):4734-4746. doi:10.18632/aging.202712

The **regenerative** potential of these **cellular reprogramming** discoveries is so profound that on **September 4, 2021**, MIT announced that **Jeff Bezos** and another billionaire are committing hundreds of millions of dollars to enable this technology to allow older people to grow biologically **younger**.

My next announcement was how we plan to implement this **bone marrow restoration** research as can be seen in the slide below:

Rebuild Bone Marrow to Restore Youth

HUMAN RESEARCH INITIATIVE:

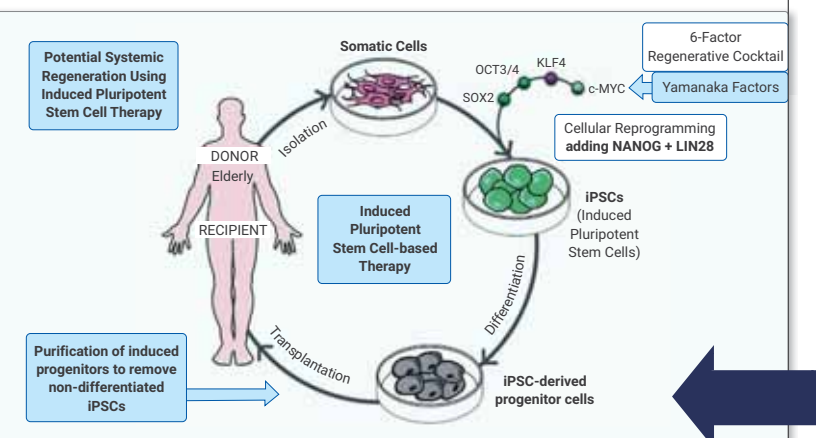
Step 1: Selectively remove senescent bone marrow cells.

Step 2: Replace with induced autologous pluripotent hematopoietic stem cells to rebuild immunity.

Step 3: Also use transcription factors to make autologous mesenchymal stem cells for systemic regeneration.

Large-animal pilot studies will first evaluate safety and regenerative efficacy.

I created the following diagram to outline the step-by-step process that we will help fund over the next two to three years to use donor cells that will be **reprogrammed** back to **pluripotent stem cells** using ***transcription factors*** and then **transplanted** into the original **donor host**:



Old **fibroblasts** reprogrammed into **autologous** induced pluripotent **stem/progenitor cells. (This kind of rejuvenation research is now being funded by Jeff Bezos and others.)**

The next two slides demonstrate *in vivo* **brain regeneration** and systemic energizing effects that occur when **young** bone marrow is transplanted into **old** rats.

Medical Xpress February 28, 2021

Young Bone Marrow Rejuvenates Aging Mouse Brains

Young Mouse (Lots of synaptic branches) | Old Mouse (Shriveled synaptic bone branches) | Old Mouse (With young bone marrow transplant)

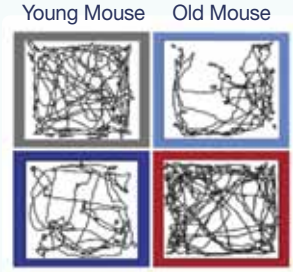
Microglia in brains of old mice have fewer/shorter branches than young mice.

Synaptic branches of microglia of old mice who received **bone marrow** transplants from **young** mice resembled those of young mice.

Credit: Cedars-Sinai / Communications Biology
Available at: https://medicalxpress.com/news/2019-02-young-bone-marrow-rejuvenates-aging.html

Nature February 20, 2019

Young Bone Marrow Transplants Restore Exploratory Activity in Old Mice



"... Young bone marrow recipients, but not old bone marrow recipients, were more active than old control mice."

(BMT means bone marrow transplant)

https://www.nature.com/articles/s42003-019-0298-5/figures/1

Das, M.M., Godoy, M., Chen, S. et al. Young bone marrow transplantation preserves learning and memory in old mice. Commun Biol 2, 73 (2019). https://doi.org/10.1038/s42003-019-0298-5

I explained that **young bone marrow transplants** are not yet feasible for **humans** because of graft versus host disease. (This does not occur in mice because they are so genetically similar.)

What these data highlight are the importance of using one's own cells (autologous) to be turned back into young cells using ***transcription factors*** and then transplanted back into the host donor (described in the humanoid graphic on the immediate left-hand column).

The next portion of my RAADfest presentation summarized research findings and news articles that had published over the past 12 months.

A consistent theme is the number of **ultra-wealthy** people donating to or investing in biomedical research that aims to reverse or eradicate pathological **aging** in humans.

As Seen on CNBC September 30, 2020

Billionaire Jim Mellon's Life Extension Start-up to Go Public in 6 to 12 months

Mellon's company, Juvenescence, has privately raised about $170 million.

Mellon said he wants to live longer than a century, and another billionaire, Michael Bloomberg, reportedly wants to live to be 125.

https://www.cnbc.com/2020/09/29/billionaire-jim-mellon-plans-to-take-life-extension-start-up-public.html

My next set of slides described a study announced in **November 2020** that made **headline news** around the world. This **hyperbaric oxygen** study showed that **telomeres** lengthened by **20%** in these **human** study subjects.[25]

I showed slides of the media proclaiming that **aging** had been reversed for the first time in humans.

To achieve these **telomere elongation** benefits, study subjects underwent **hyperbaric oxygen therapy** plus breathed in **pure oxygen** five days a week for three consecutive months.

Telomeres are tips at the end our chromosomes that shorten with each cell division. When there is no more telomere structure, cells die.

I announced that a study will soon publish showing **hyperbaric therapy** combined with healthy behavior patterns **elongated telomeres** an average of **40%** in older people!

The audience was told that we are monitoring this research and interacting with the scientists to validate whether this **telomere elongation** is associated with indicators of systemic **age reversal**.

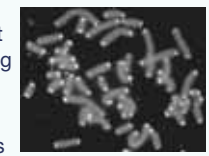
My next slides described what people can do today to reduce their rate of **telomere shortening** by:[25]

- Engaging in healthy lifestyles
- Doing high intensity interval training
- Ensuring adequate antioxidant intake
- High consumption of omega-3s
- Including walnuts in your diet
- Restricting your calorie intake

Tel Aviv University November 20, 2020

"Study Finds Hyperbaric Oxygen Treatments Reverse Aging Process"

A new study from Tel Aviv University and the Shamir Medical Center in Israel indicates that hyperbaric oxygen treatments in healthy aging adults can stop the aging of blood cells and reverse the aging process.



In the biological sense, the adults' blood cells actually grow younger as the treatments progress.

CREDIT: PD-NASA; PD-USGOV-NASA
https://medicalxpress.com/news/2020-07-hyperbaric-oxygen-therapy-protocol-cognitive.html

Novel Hyperbaric Oxygen Protocol Extends Telomere Length and Improves Immune Markers

Some immune cell telomeres elongated by 20%.

Some senescent immune cells reduced by 37%.

Improved immune markers.

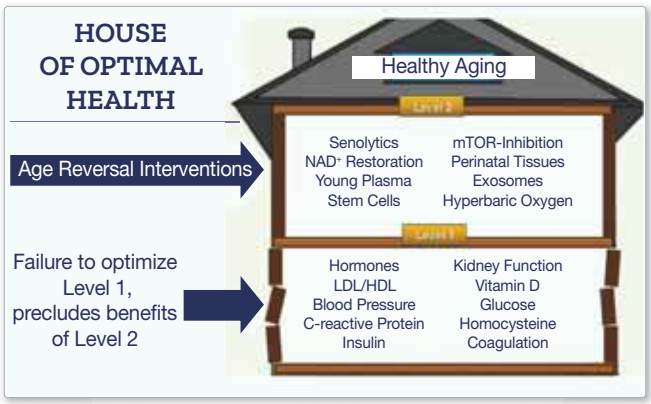
https://www.aging-us.com/article/202188/text

Our representative (on top right) inside multi-patient hyperbaric room at The Villages in Central Florida. This is much more comfortable than conventional hyperbaric chambers.

Bill Faloon interviewing Dr. Shai Efrati via ZOOM about the effects of aggressive hyperbaric therapy on telomere length.

At this point in my presentation, it was important to remind the group that these regenerative therapies are unlikely to work if we don't pay attention to health basics learned decades ago.

Level 1 as depicted on the next slide is what *everyone* should be doing now to extend their healthy lifespan. My emphasis has always been to correct **Level 1** so your body is better able to benefit from interventions such as **NAD⁺ restoration** and **young plasma**.



I next described a drug that was shown to induce rapid **reversal of cognitive decline** and markers of systemic aging in old mice. The slide below summarizes the regenerative effects of this new drug, not yet available to people:

Medical Xpress December 1, 2020

"Drug Reverses Age-related Cognitive Decline within Days"

UC San Francisco scientists show a few doses of new small-molecule integrated stress inhibitor:

- Rapid restoration of cognitive function in aged mice
- Reverse cognitive impairments in Down syndrome
- Restore memory function after traumatic brain injury
- Immune cell rejuvenation
- Enhanced cognition in healthy mice

"Just a few doses of an experimental drug can reverse age-related declines in memory and mental flexibility in mice."

https://medicalxpress.com/news/2020-12-drug-reverses-age-related-cognitive-decline.html
DOI:10.7554/eLife.62048

The value of ***transcription factors*** in restoring **eyesight** was published on **December 3, 2020** and showed **cell programming** therapy to be effective in a whole body model (beyond the petri dish).

This **Harvard** study was published in the journal ***Nature*** and received widespread media coverage because it showed reversal of vision loss as can be seen in my next two slides appearing at the top of the next column:

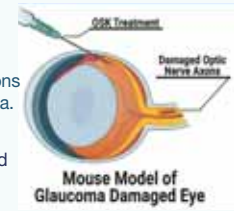
Nature December 3, 2020

"Reprogramming Retinal Cells Can Reverse Age-related Vision Loss"

Harvard researchers used three Yamanaka transcription factors to restore youthful DNA methylation pattern in retinal cells.

Old mice with damaged optic nerves regrew axons and reversed vision loss in a model of glaucoma.

"These results show that mammalian tissues retain a record of youthful information, encoded in part by DNA methylation, which can be accessed to improve tissue function and potentially reverse the effects of aging."

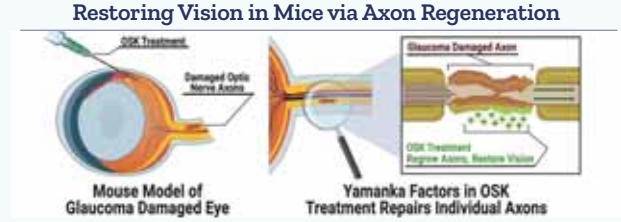


Created with Biorender.com

Lu, Y., Brommer, B., Tian, X. et al. Reprogramming to recover youthful epigenetic information and restore vision. Nature 588, 124–129 (2020). https://doi.org/10.1038/s41586-020-2975-4
https://www.nature.com/nature/volumes/588/tissues/7836

From Nature December 3, 2020

Restoring Vision in Mice via Axon Regeneration



Retinal ganglion cells (RGCs) transmit visual information from the eye to the brain along projections called axons. Damage to the RGC axons prevents transmission of this information, leading to sight loss. Lu et al.[2] report that treatment of damaged RGCs with a transcription-factor cocktail called OSK restores the cells to a youthful state, leading the axon regeneration and restoration of sight in mice.

https://www.nature.com/nature/volume/588/issue/7836 Created with Biorender.com

Year **2020** ended with an editorial published in **FORTUNE** magazine's annual investors guide that described **age-reversal** methods that had already been demonstrated in humans and animals. This FORTUNE article advocated for an "**Operation Warp Speed**" to reverse biological aging in people to avoid a "health care cost tsunami" as shown on the next three slides:

Fortune Magazine December 30, 2020

"Cracking the Code of Biological Aging Could Solve America's Health Care Crisis"

"The most exciting oportunity for such an improvement in health productivity is to understand the biology of aging."
—Eli Dourado

https://fortune.com/2020/12/30/anti-aging-research-health-care-spending-biden/

Fortune Magazine December 30, 2020

Mainstream Recognition of the Need to Reverse the Aging Process

"Without treatments to slow or reverse aspects of biological aging, an aging population means we are in for a health care cost tsunami."

"With such treatments, Americans would experience more healthy, productive years of life." *—Eli Dourado*

https://fortune.com/2020/12/30/anti-aging-research-health-care-spending-biden/

Fortune Magazine December 30, 2020

Fortune Magazine's Conclusion:

"Why not Launch an Operation Warp Speed for Biological Aging?"

— Eli Dourado

http://www.sciencedaily.com/releases/2020/01/200108160338.htm
https://fortune.com/2020/12/30/anti-aging-research-health-care-spending-biden/

I responded to this "Operation Warp Speed" challenge by showing a video clip from a **1995** national television talk show where I advocated for society to initiate a revolution against pathological aging.

The next slide describes a **January 2020** study where the C-elegans lab model lifespan was extended the **human** equivalent of over **400 years**. This breakthrough occurred in response to modulating just two cell pathways (**mTOR** and **insulin** signaling). This study received international media coverage as it demonstrated the potential for radically extended lifespans using technologies evolving today.

Science Daily January 8, 2020

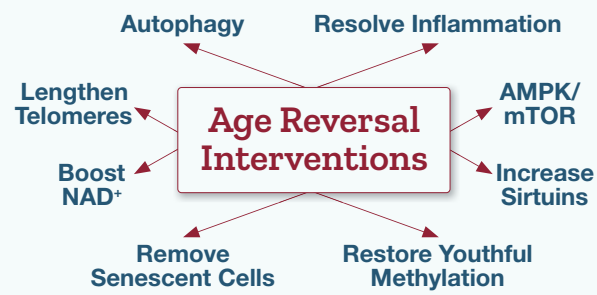
Pathways that Extend Lifespan by 500% Identified

"Scientists have identified synergistic cellular pathways for longevity that amplify lifespan fivefold in C. elegans, a nematode worm used as a model in aging research."

"The increase in lifespan would be the equivalent of a human living for **400** or **500 years**, according to one of the scientists."

Jianfeng Lan, Jarod A. Rollins, Xiao Zang, Di Wu, Lina Zou, Zi Wang, Chang Ye, Zixing Wu, Pankaj Kapahi, Aric N. Rogers, Di Chen. Translational Regulation of Nonautonomus Mitichondrial Stress Response Promotes Longevity. Cell Reports, 2019;28(4): 1050 DOI: 10.1016/j.celrep.2019.06.078

The next slide summarizes interventions that people are self-experimenting with today to counteract multiple mechanisms of pathological aging.



Moving forward to **January 2021**, a study using a simple **CRISPR** editing technique more than doubled lifespan of progeroid mice.

from *The Wall Street Journal* Jan. 7, 2021

CRISPR GENE-EDITING TREATMENT

"... mice with progeria that got the gene-editing treatment lived more than twice as long as the untreated mice."

https://www.wsj.com/articles/crispr-genev-editing-treatment-could-point-way-to-fix-for-deadly-aging-disease-11609950054

from *The Wall Street Journal* Jan. 7, 2021

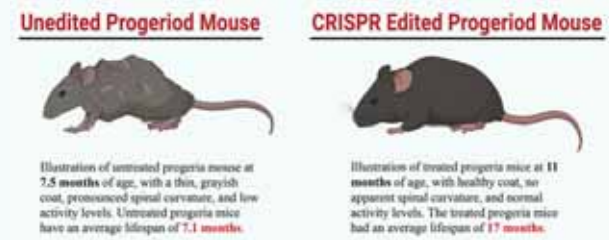
CRISPR GENE-EDITING TREATMENT
"Could Point Way to Fix for Deadly Aging Disease."

Median lifespan of CRISPR-treated mice was 510 days compared to 215 days for the unedited group. If this model of progeria applies to humans, children with progeria might live into their forties or later.

https://www.wsj.com/articles/crispr-genev-editing-treatment-could-point-way-to-fix-for-deadly-aging-disease-11609950054

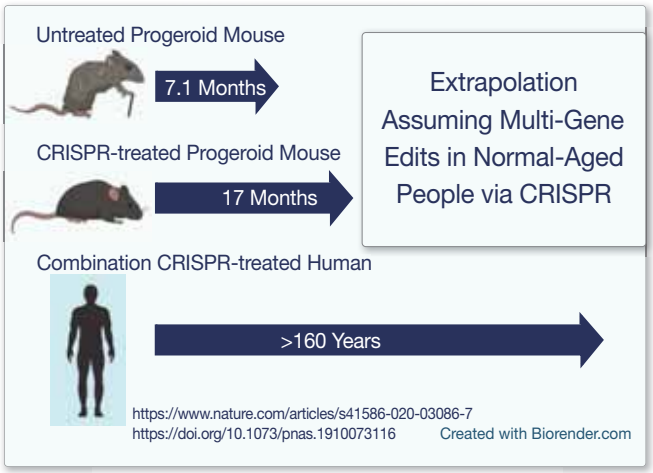
Progeria is a genetic disease that causes accelerated aging in afflicted people. Death usually occurs between ages 12-20 with debilitating degenerative changes emerging in early life. Not only did the CRISPR-edited progeroid mice live much longer, but they remained free of the degenerative changes far longer.

CRISPR Gene-Editing Treatment

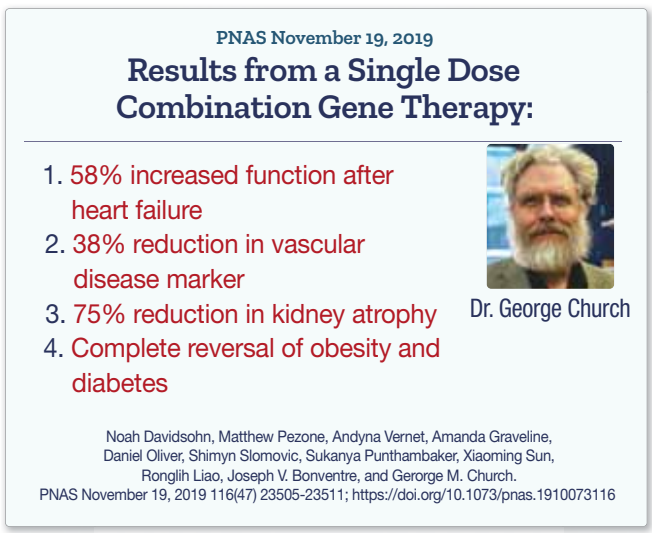


https://www.wsj.com/articles/crispr-gene-editing-treatment-could-apoint-way-to-fix-for-deadly-aging-disease-11609950054 Created with Biorender.com

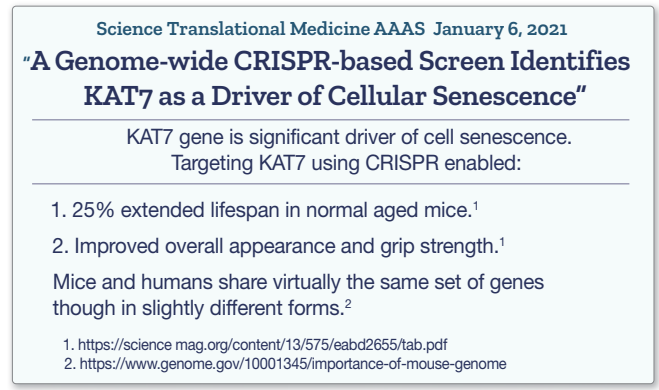
Under the optimistic extrapolation that combination CRISPR gene editing therapy might enable normal aged people to benefit, I created a chart showing what the human lifespan potential could be if combination CRISPR produced these same benefits.



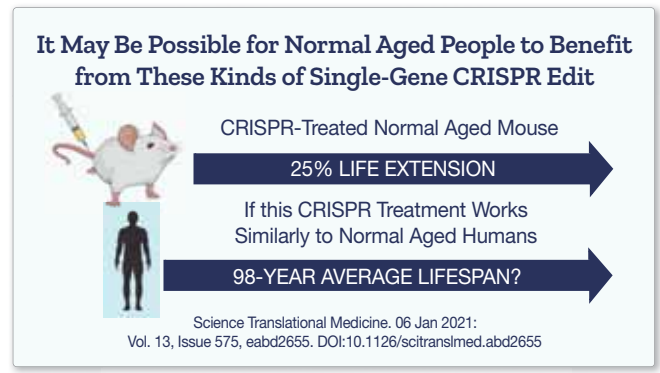
Not all our advisors agreed with this optimistic extrapolation, but I pointed out that a single dose of combination **CRISPR** treatment was shown in **November 2019** to reverse multiple effects of aging in mice as shown on the following slide:



On the same day the **CRISPR** study on progeroid mice was published (Jan 6, 2021), another study more relevant to normal **aging** found the CRISPR edit of just one senescence-accelerating gene (KAT7) increased lifespan by **25%** in mice. The CRISPR-treated mice also had improvements in overall **appearance** and **grip strength**.

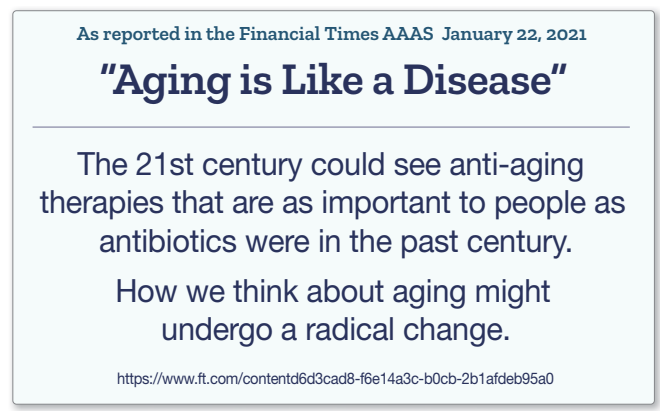


I then presented another optimistic extrapolation that if this simple single-gene edit works in people the same way as mice, our average lifespan might increase to **98 years** (from the pathetically short 77-78 years today).



The January 22, 2021 issue of a prestigious international business newspaper (***Financial Times***) described aging as a "**disease**" and talked about **anti-aging** therapies this century that could prove as transformative as **antibiotics** were in the last century.

Life Extension has fought a **42-year** war to persuade the public (and government) to recognize **aging as a disease** that future treatments might eradicate. It's finally going mainstream!



On **February 20, 2021**, ***Web*MD** published an editorial titled **"Is there a Cure for Aging?"** and described groups that are seeking to **reverse engineer** our biological clock to "***prevent death itself***."

***Web*MD** then described species like the "immortal jellyfish" and lobsters that seemingly live forever (if not eaten first).

WebMD February 20, 2021

"Is There a Cure for Aging?"

An article published on WebMD.com describes billions of dollars of investor money that seek to significantly improve human biology.

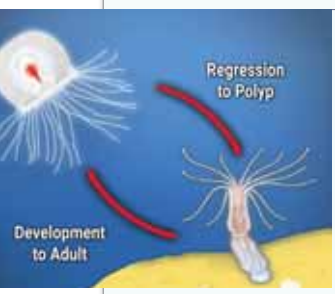
WebMD describes heroic efforts being made to eliminate lethal diseases and prevent death in people.

The WebMD website published a moving graph showing that by around year 2065, life expectancy potential of people might approach 900 years.

https://www.webmd.com/healthy-aging/story/is-there-a-cure-for-aging

WebMD February 20, 2021

Animals That Appear to Live Indefinitely



Created with Biorender.com

The *Turritopsis dohrnii* jellyfish may be immortal according to some scientists. It can renew its own life indefinitely by transforming back to an infantile stage if it becomes damaged, starved, sick or old.

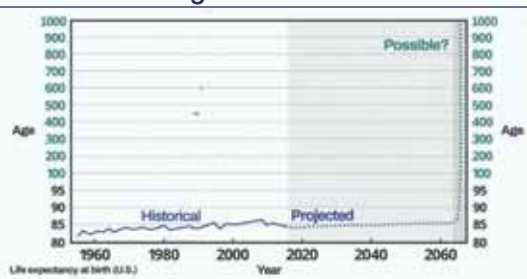
Lobsters (if not eaten first) produce a youthful enzyme that has some scientists speculating if there may be an upper limit to its longevity potential.

https://www.webmd.com/healthy-aging/story/is-there-a-cure-for-aging

What surprised me was a moving graph published by ***Web*MD** showing human lifespan potential of over **900 years** occurring around year **2065**. I made it clear this chart did not come from an age reversal research group, but ***Web*MD** itself:

WebMD February 20, 2021

How Long Can Humans Live?



The World Bank Data Catalog
https://www.webmd.com/healthy-aging/story/is-there-a-cure-for-aging

On **March 2, 2021**, another **CRISPR** study was announced where it significantly reduced cholesterol and triglyceride levels in mice. The significance of this finding is that it may be possible to optimize artery-clogging lipids in people without the need for statin and other drugs commonly used today.

Science Alert March 2, 2021

CRISPR May Eliminate Neeed for Drugs

Single CRISPR injection reduces cholesterol up to 57% in mice.

"In addition to the cholesterol reduction, the experiment produced a 29.4% decrease in triglycerides..."

—Peter Dockrell

https://www.sciencealert.com/experimental-crispr-treatment-cuts-cholesterol-in-mice-by-up-to-57-in-single-shot

A few days later (March 8, 2021), the **Nobel Prize in Chemistry** was awarded to two scientists working to engineer humans to be disease resistant.

The **FDA** approved the first study in human history of an anti-aging drug (metformin) in **2015**. This was the first time the FDA approved a clinical trial that targets markers of human "aging" as a clinical end point.

In early **2021**, the FDA approved two additional clinical trials where **metformin** will be studied to see if measures of age-delay and age reversal occur in **older people**.

I reminded the group that when metformin was combined with DHEA and growth hormone for one year, markers of **human aging** were reversed **2.5 years** as measured by the Horvath Epigenetic Clock.

Aging Cell September 2019

Thymic Age Reversal Demonstrated in 2019

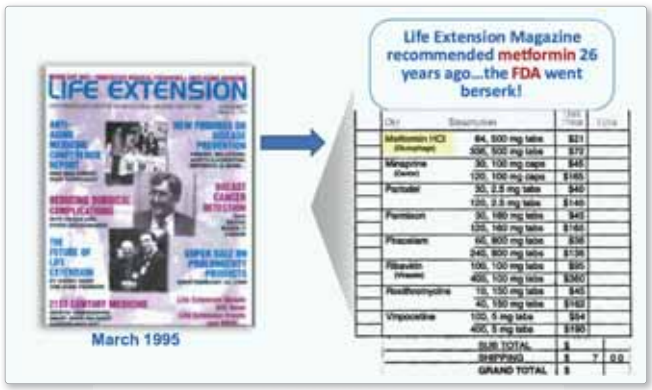
Study conducted by **Dr. Greg Fahy** in collaboration with researchers from **Stanford University** and **UCLA** used individualized doses of:

- Human growth hormone
- DHEA
- Metformin

Study subjects also provided with daily vitamin D3 and zinc.

Reversal of epigenetic aging and immunosenescent trends in humans, GM Fahy, RT Brooke, JP Watson, Z Good... - Aging Cell, 2019

I mentioned that **metformin** had been listed as an **anti-aging drug in *Life Extension Magazine*®** in **1995**:



I next provided some updates on **rapamycin** and how people can participate in a clinical trial that will measure aging parameters in people over a 12-month period receiving two different weekly doses of rapamycin:

April 2021

mTOR Inhibition with Rapamycin Improves Alzheimer's in Mouse Model of Disease

Effects of rapamycin in mouse model of Alzheimer's:

- Improved cerebrovascular function (better than non-Alzeimer's mice)
- Reduction of *beta-amyloid* in brain cortex
- Reversed memory deficits

mTOR Attenuation with Rapamycin Reverses Neurovascular Uncoupling and Memory Deficits in Mice Modeling Alzheimer's Disease. Candice E. Van Skike, Stacy A. Hussong, Stephen F. Hernandez, Andy Q. Banh, Nicholas DeRosa, Veronica Galvan Journal of Neuroscience 12 May 2021, 41 (19) 4305-4320; DOI: 10.1523/JNEUROSCI.2144-20.2021. PMID 33888602.

From ClinicalTrials.gov June 18, 2021

Rapamycin Human Study Receives $485,000 Funding

- Randomized, placebo-controlled trial into the safety/efficacy of rapamycin in reducing clinical measures of aging in older population.
- Two differing doses: **5 mg** or **10 mg** of rapamycin one time a week or a placebo.
- Primary Outcome Measure: Changes in visceral fat as measured by (DXA) scan.
- Secondary Outcomes: Range of clinical measures, e.g., bone density, blood tests, etc.
- 20 people enrolled at $360 each (original cost before donations was $1,200).

Principal investigators: James Watson, M.D. and Sajad Zalzala, M.D. Sponsor: AgelessRx Collaborator: University of California, Los Angeles To enroll log on to: https://wwwagelessrx.com/pearl

Data on **senolytics** continue to validate their potential efficacy including enhancing **kidney function** in mice.

My next slide was a discovery at the **Buck Institute** on a way to measure the effects of **senolytics**. This research has been transferred to **Tufts University** where our **Age Reversal Network** (www.age-reversal.net) will assist in identifying suitable human study subjects.

May 19, 2021

More Than 50% of Americans over age 75 are Believed to Have Kidney Disease[1]

Senolytic Enhances Kidney Regeneration in Mice

Senolytic treatment with ABT-263:

- Reduced senescent cell numbers
- Restored regenerative profile in aged mouse kidney
- Improved kidney function[2]

1. https://www.kidney.org/news/monthly/wkd_aging
2. Mylonas KJ, O'Sullivan ED, Humphries D, Baird DP, Docherty MH, Neely SA, Krimpenfort PJ, Melk A, Schmitt R, Ferreira-Gonzalez S, Forbes SJ, Hughes J, Ferenbach DA. Cellular senescence inhibits renal regeneration after injury in mice, with senolytic treatment promoting repair. Sci Transl Med. 2021 May 19;13(594):eabb0203. doi: 10.1126/scitranslmed.abb0203. PMID: 34011625.

June 1, 2021

Buck Institute Announces Non-Invasive Test to Measure Senolytic Efficacy

- Precise measure of senescent cell destruction demonstrated in cell culture and mice.
- USDA funding full-time research at Tufts University to make this available to humans.
- Age Reversal Network will assist to develop this test of senolytic therapy efficacy for upcoming clinical trials. (September 8, 2021)
- When available, this test will enable precise dosing of senolytic drugs and nutrients.

https://www.cell-metabolism/pdf/S15504131(21)00115-7.pdf

On **June 26, 2021**, the first **human** trial using **CRISPR** gene therapy was shown to reduce serum levels of a misfolding protein (transthyretin) in a form of a disease called **amyloidosis**.

From Fierce Biotech June 26, 2021

First Human Trial Using CRISPR

- Transthyretin amyloidosis is caused by the accumulation of misfolded transthyretin proteins.
- Misfolded transthyretin amyloid proteins build up and cause heart failure and other diseases.
- If left untreated death occurs in 2 to 5 years.

CRISPER/Cas9 gene editing reduced serum levels of transthyretin, a key biomarker for the disease, by 87% in humans.

(Standard care therapy typically reduces transthyretin by 80%.)

This is the first time gene editing has been proven to work in humans, which "opens up a whole new area of therapies for patients that wasn't there."

https://www.fiercebiotech.com/biotech/first-human-trial-results-intellia-shows-world-gene-editing-has-arrived

On **July 6, 2021**, *Popular Mechanics* announced that the U.S. military is studying the **NAD+** precursor **nicotinamide riboside** to improve human performance.

From Popular Mechanics July 6, 2021

"The U.S. Military is Testing a Pill that Could Delay Aging"

- U.S. Special Operations Command Investing more money in anti-aging clinical trials.
- Trial to start soon of "anti-aging pill"
- NAD+ precursor being tested to enable "improved human performance…like Increased endurance and faster recovery from injury."

"Reduced levels of NAD+ are linked to aging and numerous diseases, including mitochondrial dysfunction, inflammation and a variety of associated diseases. These levels decline as humans age and remain depleted during disease states."

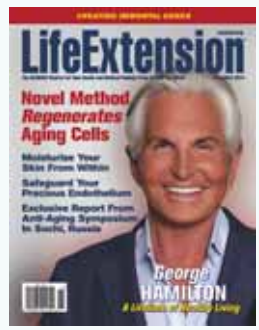
https://www.popularmechanics.com/science/health/a36905562/usmilitary-testing-anti-aging-pill/

I reminded the audience that most of them had been using **nicotinamide riboside** for many years based on publications in *Life Extension Magazine*®.

Life Extension Magazine November 2014

NAD+ Restoration Turned Real 7 Years Ago

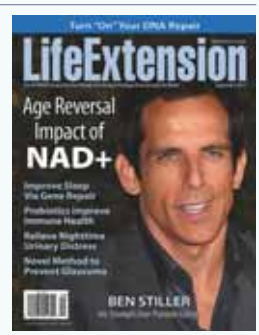
- Since **2001 Life Extension** has sought ways to restore **NAD+**.
- **NAD+** helps turn "off" degenerative processes.
- Proven methods to boost **NAD+** became available in circa **2014**



Life Extension Magazine September 2017

NAD+ Sharply Plummets with Age

- At age 50, we have 50% less cell NAD+ than at age 20.
- By age 80, NAD+ levels Drop by as much as 98%.



I concluded this portion of my presentation by showing the cover of the **September 2021** issue of **Prevention** magazine.

The significance of this is that for decades, **Prevention** had been critical of attempts to slow biological aging. In those early days, Prevention viewed aging as a natural process that should not be interfered with.

The September 2021 article in **Prevention** favorably described research on everything we have been studying. I complimented **Prevention** and others for waking up to the fact that there are methods beyond healthy lifestyles that may extend healthy lifespans.

Prevention Magazine September 2021

Prevention Magazine Favorably Describes:

- Intermittent Fasting
- Metformin
- DNA methylation testing
- Sirtuin activation
- Young plasma transfer
- Senolytic drugs

The next segment of my presentation moved on to what people can do now to slow aging and reduce disease risk.

One of my focuses was on the benefits of **intermittent fasting**. The most popular way people are doing this today is **fasting** (nothing but water, black coffee, or tea) for about 16 hours most days and consume a reasonable number of calories during an eight-hour period.

The benefits are enormous, including boosting **AMPK**, turning down excess **mTOR** and enabling a cellular housekeeping process to occur known as **autophagy**.

Stated succinctly, **autophagy** enables **cellular housekeeping** to occur.

If one does not take a break from constantly ingesting calories, cells never get a chance to remove cellular waste products that accumulate.

Those unable to fast often rely on **AMPK activating** compounds and/or those that directly suppress **excess mTOR**.

Intermittent Fasting Update: Time-Restricted Eating

16
hours fasted
8
hours fed

From the New England Journal of Medicine Dec. 26, 2019

Effects of Intermittant Fasting on Health, Aging, and Disease

Animal models show consistent robust benefits of **intermittent fasting**:

- Suppresses inflammation
- Reduces obesity and type II diabetes
- Protects against cardiovascular disease
- Lowers risk of neurodegenerative disorders
- Reduces cancer incidence

https://nejm.org/doi/full/10.1056/NEJMra1905136

Nature Research October 27, 2020

"Intermittent fasting from dawn to sunset for 4 consecutive weeks induces anticancer serum proteome response & improves metabolic syndrome."

No eating/drinking from dawn to dusk… **14-15** hours each day:

- **7.25 pounds** of **weight loss**
- **8.8 mmHg** reduction in **blood pressure**
- Significant increase in **tumor suppressor/anticancer proteins**
- Significant decrease in several **tumor promoter/ pro-cancer** proteins
- Increasing a protein called **calreticulin** (by around **16 times**)
- Calreticulin enhances **IgG response** to a **SARS-CoV** spike protein

Scientific Reports,(2020)10:18341 https://doi.org/10.1038/s41598-020-73767-w
https://creativecommons.org/licenses/by/4.0/legalcode

In addition to fasting, I advocated for the audience to consume a **Mediterranean diet** and showed several slides about healthy foods people should consume and toxic ones to avoid.

The first two slides in the next column show the remarkable reductions in **mortaltiy** in those who adhere more to a **Mediterrean diet**.

I showed three of the many ***Life Extension***® magazines that have long advocated for readers to follow a **Mediterrean diet**.

From the British Journal of Nutrition

"Mediterranean Diet and Mortality in the Elderly: A Prospective Cohort Study and Meta-analysis"

"In the multi-variable model, high adherence to the **Mediterranean diet** was associated with **25% lower risk of death** as compared with the lowest category."

Published online by Cambridge University Press: 30 August 2018
https://www.cambridge.org/core/journals/british-journal-of-nutrition/article/mediterranean-diet-and-mortality-in-the-elderly-a-prospective-cohort-study-and-a-metaanalysis/F2D6B083AA1878494771 12DB77820521

American Heart Association June 30, 2021

Mediterranean Diet Score, Dietary Patterns and Risk of Sudden Cardiac Death

Study of **21,000** people over **9.8** years reveals:

- Diet high in fried foods, organ meats and processed meats regularly had a **46%** ***higher*** risk of **sudden cardiac death** compared to those with least adherence.
- Those who most closely followed the traditional **Mediterranean diet** had a **26%** ***lower*** risk of sudden cardiac death than those with the least adherence to this eating style.

Mediterranean diet defined as high in vegetables and whole grains, low intake of meat, high intake of marine omega-3s.

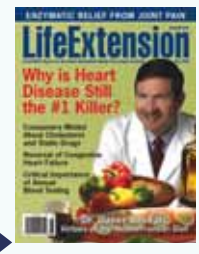
Originally published 30 June 2021 https://doi.org/10.1161/JAHA.120.019158
Journal of the American Heart Association

Mediterranean Diet Healthy Foods

More fruits, vegetables, and whole grains, and less dairy & meat than typical western diet.

Life Extension Magazine

Longevity Benefits of Mediterranean Diet



May 2008

April 2015

Sept 2016

My presentations include photos and descriptions of dead **billionaires** who are missing the super-longevity boat. In the example below, I mention an individual who died of a **heart attack** at the early age of **57**. Was he having comprehensive **blood tests** and taking corrective actions? I don't know, but too many people fail to test for proven causes of cardiovascular disease.

Who Missed the Longevity Boat?

Baron Benjamin de Rothschild (1963-2021)

Expiration date:
Jan. 15, 2021
Net worth >$1.5 billion

Heir to a French banking fortune, died of a heart attack at age 57 on January 15, 2021.

He oversaw the Edmond de Rothschild empire, which has stakes in banks in France and Switzerland, owns restaurants, hotels, and vineyards in Argentina, New Zealand, South Africa, Spain and France.

https://www.Forbes.com/profiles/benjamin-de-rothschild

Heart disease mortality has plummeted by **68%** since **1969**, but that statistic means nothing if you are part of the group still dying from heart disease.

Reduction in Heart Disease Mortality in the United States

Age-standardized **death rate** from **heart disease** per 100,000 people dropped:

From: **520** in **1969**
To: **167** in **2014**

68% decline over 45 years

Weir HK, Anderson RN, Coleman King SM, Soman A, Thompson TD, Hong Y, et al. Heart Disease and Cancer Deaths — Trends and Projections in the United States, 1969–2020. Prev Chronic Dis 2016;13:160211. DOI: http://dx.doi.org/10.5888/pcd13.160211external icon

Perhaps the easiest way of slashing **heart attack** risk is to have an at-home **Omega-3 Index** test and target a level above **6.8%.**

Life Extension Magazine August 2020

The **Omega-3 Index** is a blood test that measures the **percent** of omega-3 fatty acids in red blood cells.

Red blood cell **EPA/DHA** content is a good measure of sustained omega-3 status.

You want your **Omega-3 Index** score to be **> 6.8%.**

Typical Japanese Omega-3 Index is > **8.0%.** That may correlate with **5 year** *longer* life expectancy in **Japan.**

Two recent published studies substantiate the benefit of achieving a *higher* **Omega-3 Index** score.

December 2018

Omega-3-Index and Risk of Death

People with **omega-3** RBC scores > **6.8%** compared with those < **4.2%:**

39% lower risk for **cardiovascular** disease
34% lower risk of **death** from *any* cause

(Subjects average age 66 and followed over 7 years)

Higher **Omega-3 Index** associated with reduced risks because of:

- Lowering of **triglycerides, blood pressure, platelet aggregation, heart rate**
- Lower markers of **inflammation** and **arterial plaque** vulnerability
- Reduced rate of telomere rate attrition

Journal of Clinical Lipidology (2018) 12, 718-727.

June 16, 2021

Higher Omega-3 Blood Score = Nearly 5 years Increased Life Expectancy

- Predictive model for correlation/association from Framingham Offspring Cohort (n=2,240)
- Baseline omega-3 index score and relevant covariates evaluated over **11-year** follow-up.
- Standard risk adjustments: age, sex, total cholesterol, HDL cholesterol, hypertension treatment, systolic blood pressure, smoking status, prevalent diabetes.
- Extensive **validation** process to account for confounding risk factors.

Analysis reveals red blood cell **omega-3 index** over **6.8%** in people is associated with **4.7 years** additional **life expectancy** compared with **omega-3 index** under **4.2%.**

The American Journal of Clinical Nutrition, ngab195. https//: 10.1093/ajcn/nqab195

Yet **53%** of **Life Extension** supporters have less-than-optimal **omega-3** status as shown on slide below:

Life Extension July 27, 2021

Omega-3 Index Scores in Life Extension Supporters

53.7% have Omega-3 Index scores < **6.8%**

- Only **1,300 mg** of added **EPA/DHA** from fish/supplements moves **Omega-3 Index** from < **4.2%** to > **6.8%.**
- **Plant** derived omega-3 precursors (ALA) not shown to achieve these robust EPA/DHA increases.
- **Omega-3 Index** at-home test costs $74.25—May save $$$ on fish oil supplements.

Omega-3 Index test available at: www.LifeExtension.com/blood

Journal of Clinical Lipidology (2018) 12, 718-727.

The **Omega-3 Index** is available from several labs. Those who want to order from Life Extension can do so by calling **1-800-208-3444** or logging on to: www.LifeExtension.com/blood

I finish my presentation with a transhumanist update including a study published in the ***New England Journal of Medicine*** in **July 2021** where a brain implant into a stroke-paralyzed patient enabled the patient to translate words from their brain on to a computer screen.

New England Journal of Medicine July 14, 2021

"Brain Implant Lets Man Speak After Being Silent for More Than A Decade"

New England Journal of Medicine study shows brain implant in a stroke paralyzed (15 years) patient enabled brain signals to be translated into words on a computer screen.

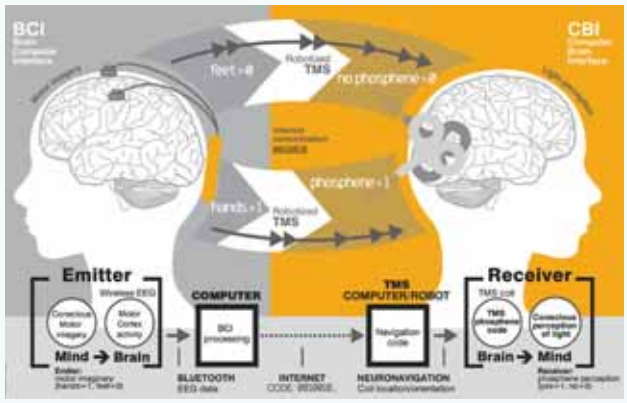
Comment by expert on brain-computer interfacing: "Human Brain/Cloud Interface technologies will empower us to preserve crucial brain information, interface our brain directly with the cloud, positively impact learning, and provide data for the study of consciousness. This technology is not distant in the future, as many believe."—Nuno R.B. Martins, Ph.D (July 28, 2021)

https://www.nejm.org/doi/full/10.1056/NEJMoa2027540
https://www.wsj.com/articles/brain-implant-lets-man-speak-after-being-silent-for-more-than-a-decade-11626296422

This finding advances the concept of the brain/cloud interface where the human brain might merge with the Cloud and achieve limitless self-improvements according to futurist **Ray Kurzweil**.

Frontiers in Neuroscience March 20, 2019

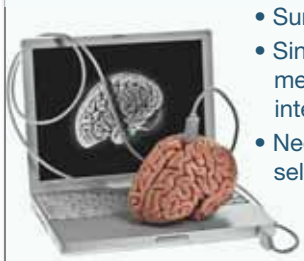
Human Brain/ Cloud Interface



Human brains could be connected to the internet in "the next few decades" scientists predict.

Martins NRB, Angelica A, Chakravarthy K, Svidinenko Y, Boehm FJ, Opris I, Lebedev MA, Swan M, Garan SA, Rosenfeld JV, Hogg T and Freitas RA Jr (2019) Human Brain/Cloud Interface. Front. Neurosci. 13:112. doi: 10.3389/fnins.2019.00112
https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0105225
Conscious Brain-to-Brain Communication in Humans Using Non-Invasive Technologies
Carles Grau,Romuald Ginhoux, Alejandro Riera,Thanh Lam Nguyen, Hubert Chauvat, Giulio Ruffini

Ray Kuzweil's Exit Plan to Immortality



- Survive until year 2045
- Singularity enables neocortex to merge with cloud-based artificial intelligence
- Neocortex/AI enters limitless self-improvement cycles.

Result is superintelligence that advances our abilities to incomprehensive levels.

I showed the group an announcement made on **July 30, 2021** where **Elon Musk** has raised an additional **$205 million** to develop brain implants that can directly communicate with phones and computers.

CNBC July 30, 2021

Elon Musk's Brain Computer Startup Raises $205 Million from Google Ventures and Others

- Neuralink is trying to develop high-bandwidth brain implants that can communicate with phones and computers
- Total investment in the company now stands at $363 million.

https:// www.cnbc.com/2021/07/30/elon-musks-neuralink-backed-by-google-ventures-peter-thiel-sam-altman.html

And for skeptics who cannot comprehend the magnitude of this, I went back to **1903** when the first heavier-than-air flight made headline news around the world, but virtually no one at the time envisioned flying buses.

International Headline News December 17, 1903

Flying Machine Takes to the Air!

A mere 54 years after the **Wright Brothers**, intercontinental air travel became routine.

December 20, 1957

Intercontinental Air Travel— 54 Years After Wright Brothers First in Flight

I analogized the rapid pace of science further with the Mars Rover that has a flying helicopter that is controlled remotely from earth.

April 9, 2021

Exponential Advances in Only 118 Years

1903

2021

Getting back to **cellular reprogramming**, I analogized what may happen if the biomedical sciences advance as quickly as aviation did.

Scientific Breakthroughs and Subsequent Advances

- **1903** First "Flying Machine" travels **120 feet** at Kitty Hawk

118 Years Later

- **2021** Robot + helicopter travel **140 million** miles to Mars

- **2011** Cells from **100-year-old human** fully **rejuvenated***

11 Years Later

- **2022** Autologous iPSC studied for systemic rejuvenation

* https://pubmed.ncbi.nlm.nih.gov/22056670/

I summarized how quickly we are rewriting the **rules of biology** with the following slide:

Cellular Reprogramming
Rewriting the Rules of Biology

- Time-honored doctrine of biology was that the fate of cells was irreversibly determined, and that rejuvenation was impossible.
- Starting in 2006, **cell reprogramming** demonstarted cellular rejuvenation.
- Rejuvenation achieved in cells from very old **humans** (2011).
- Research underway to rejuvenate whole organisms (including humans).
- The "impossible" was achieved overnight via **cellular reprogramming**.

https://pubmed.ncbi.nlm.nih.gov/33627519

Our Mission!

Surging numbers of **elderly** Americans are suffering and causing astronomical medical outlays.

The best solution is to delay and reverse degenerative changes that occur in aged people. Even modest success will improve quality and quantity of life while averting a healthcare cost crisis.

I want to welcome a record number of new supporters who have joined our **Life Extension** community.

Some want to read everything they can in the **anti-aging** field while others mainly seek access to high-quality **dietary supplements**.

Every time you purchase a **nutrient formula** or **blood test** from **Life Extension**, you support scientists on the cutting edge of regenerative medicine **research**.

Those who want to receive **free** email updates about research findings, scientific conferences, and clinical trials should enroll at:

www.age-reversal.net

Annual RAADfest Conference

RAADfest is a non-profit scientific conference that I help to financially subsidize. It enables people to stay informed and connect with many of the best doctors, scientists and thought leaders in the field.

RAADfest 2022 will be held live in **San Diego**, California on October 6-9, 2022, taking proper precautions to make it safe and enjoyable.

The registration is affordable at $620 and this includes organic meals so the entire group can stay together and interact.

To learn more and reserve your place, and to see RAADfest's comprehensive safety and cancellation policies log on to:

www.Raadfest.com

In Summary...

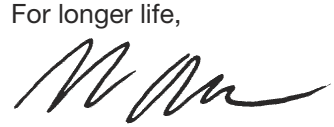
It is a personal privilege to interact with and fund scientists on the front lines of regenerative medicine research.

My objective is to save as many human lives as possible including our own.

For those seeking to **delay aging** today, the article on page 18 of this month's isssue describes how eating a particular food group can add many healthy years to your **life expectancy**.

Welcome to our fantastic voyage!

For longer life,



William Faloon, Co-Founder
Age Reversal Network

A Bodyguard *for Your* Brain

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

Lithium is a low-cost mineral that functions in several ways to support cognition and overall brain health.

Protect healthy cognition with lithium—it's like a bodyguard for your brain!

LITHIUM
(**1000 mcg** of **lithium** per tiny cap)

Item #02403
100 vegetarian capsules

1 bottle **$12**
4 bottles **$10.50** each

Each bottle lasts 100 days.

European Journal of Nutrition. 2011;50(5):387-389

GLUTEN FREE
NON GMO LE CERTIFIED

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

FISETIN

The Longevity Flavonoid

Fisetin, a flavonoid found in strawberries and apples, is currently being studied for its effectiveness as a **senolytic** in humans.[1]

In preclinical studies, fisetin:

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

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.[9]

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

References

1. Available at: https://www.mayo.edu/research/clinical-trials/cls-20438802. Accessed June 22, 2020,
2. *Life Sci.* 2018 Jan 15;193:171-9.
3. *Mini Rev Med Chem*. 2018;18(13): 1151-7.
4. *Nutr Res Pract.* 2017 Oct;11(5):430-4.
5. *Biochem Biophys Res Commun.* 2015 Nov 27;467(4):638-44.
6. *Int Immunopharmacol.* 2017 Apr;45: 135-47.
7. *EBioMedicine.* 2018 Oct;36:18-28.
8. *J Nutr Biochem.* 2013 Aug;24(8):1547-54.
9. *Manufacturer's study (in press for future publication)*. 2020.

GLUTEN FREE

NON GMO LE CERTIFIED

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**

Increase AMPK to Better Manage Body Weight

Most people today consume excess calories.

This results in **mTOR** constantly running at high gear, which is a factor in unwanted **fat storage**.

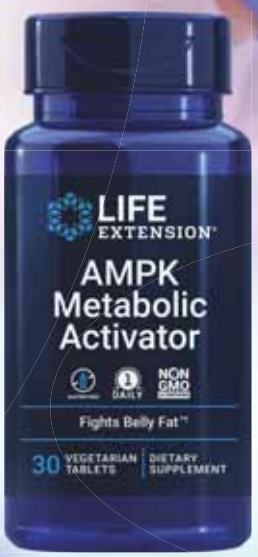
Studies show that increasing **AMPK** activity turns down excess **mTOR**.[1]

Reduce Cell Fat Storage

Scientific studies show that increasing **AMPK** activity can encourage cells to store less fat and burn it as energy.[2,3]

AMPK Metabolic Activator was formulated based on data showing reduced **belly fat** in response to just one of its ingredients (*Gynostemma pentaphyllum*).[3]

This ***Gynostemma pentaphyllum + hesperidin*** formula is designed to support healthy **AMPK** cellular activation.



Item #02207 • 30 vegetarian tablets

1 bottle **$28.50** • 4 bottles $24 each

GLUTEN FREE · 1 DAILY · NON GMO LE CERTIFIED

References

1. *Anticancer Agents Med Chem*. 2013 Sep;13(7):967-70.
2. *Nutr J*. 2016;15:6.
3. *Obesity (Silver Spring)*. 2014;22(1):63-71.

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

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

Actiponin® is a trademark of TG Biotech Co., Ltd.

PRODUCTS

ACTIVE LIFESTYLE & FITNESS

01529 Creatine Capsules
02020 Super Carnosine
02023 Tart Cherry with CherryPURE®
02146 Wellness Bar–Chocolate Brownie
02147 Wellness Bar–Cookie Dough
02246 Wellness Code® Advanced Whey Protein Isolate Vanilla
02221 Wellness Code® Muscle Strength & Restore Formula
02127 Wellness Code® Plant Protein Complete & Amino Acid Complex
02261 Wellness Code® Whey Protein Concentrate Chocolate
02260 Wellness Code® Whey Protein Concentrate Vanilla
02243 Wellness Code® Whey Protein Isolate Chocolate
02242 Wellness Code® Whey Protein Isolate Vanilla

AMINO ACIDS

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

BLOOD PRESSURE & VASCULAR SUPPORT

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

BONE HEALTH

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

BRAIN HEALTH

01524 Acetyl-L-Carnitine
01974 Acetyl-L-Carnitine Arginate
02419 B12 Elite
01659 CDP Choline
02321 Cognitex® Basics
02396 Cognitex® Elite
02397 Cognitex® Elite Pregnenolone
01540 DMAE Bitartrate
02006 Dopa-Mind™
02413 Dopamine Advantage
02212 Focus Tea™
01658 Ginkgo Biloba Certified Extract™
01527 Huperzine A
00020 Lecithin
02101 Memory Protect
00709 Migra-Eeze™
01603 Neuro-Mag® Magnesium L-Threonate Caps
02032 Neuro-Mag® Magnesium L-Threonate Powder
00888 Optimized Ashwagandha
01676 PS (Phosphatidylserine) Caps
02406 Quick Brain Nootropic
01327 Vinpocetine

CHOLESTEROL MANAGEMENT

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

DIGESTION SUPPORT

53348 Betaine HCl
02412 Bloat Relief
30747 Digest RC®
07136 Effervescent Vitamin C - Magnesium Crystals
02021 Enhanced Super Digestive Enzymes
02022 Enhanced Super Digestive Enzymes and Probiotics
02033 EsophaCool™
01737 Esophageal Guardian
01706 Extraordinary Enzymes
02100 Gastro-Ease™
01122 Ginger Force™
00605 Regimint
01386 TruFiber®

ENERGY MANAGEMENT

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

EYE HEALTH

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

FISH OIL & OMEGAS

02311 Clearly EPA/DHA Fish Oil
01937 Mega EPA/DHA
02218 Mega GLA Sesame Lignans
01983 Super Omega-3 EPA/DHA Fish Oil, Sesame Lignans & Olive Extract • 60 softgels
01988 Super Omega-3 Plus EPA/DHA Fish Oil, Sesame Lignans, Olive Extract, Krill & Astaxanthin
01982 Super Omega-3 EPA/DHA Fish Oil, Sesame Lignans & Olive Extract • 120 softgels

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

FOOD

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

GLUCOSE MANAGEMENT

01503 CinSulin® with InSea$^{2®}$ and Crominex® 3+
01620 CoffeeGenic® Green Coffee Extract
02122 Glycemic Guard™
00925 Mega Benfotiamine
01803 Tri Sugar Shield®

HEART HEALTH

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

HORMONE BALANCE

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

IMMUNE SUPPORT

02411 5 Day Elderberry Immune
00681 AHCC®
02302 Bio-Quercetin®
02410 Black Elderberry + Vitamin C
01961 Enhanced Zinc Lozenges
01704 Immune Modulator with Tinofend®
02425 Immune Packs with Vitamin C & D, Zinc and Probiotic
02005 Immune Senescence Protection Formula™
00316 Kyolic® Garlic Formula 102
00789 Kyolic® Reserve
01681 Lactoferrin (Apolactoferrin) Caps
02426 Mushroom Immune with Beta Glucans
01903 NK Cell Activator™
01394 Optimized Garlic
01309 Optimized Quercetin
01811 Peony Immune
00525 ProBoost Thymic Protein A
01708 Reishi Extract Mushroom Complex
01906 Standardized Cistanche
13685 Ten Mushroom Formula®
01097 Ultra Soy Extract
01561 Zinc Lozenges

INFLAMMATION MANAGEMENT

01639 5-LOX Inhibitor with AprèsFlex®
02324 Advanced Curcumin Elite™ Turmeric Extract, Ginger & Turmerones
01709 Black Cumin Seed Oil
02310 Black Cumin Seed Oil and Curcumin Elite™
00202 Boswella
02467 Curcumin Elite™ Turmeric Extract • 30 veg capsules
02407 Curcumin Elite™ Turmeric Extract • 60 veg capsules
01804 Cytokine Suppress® with EGCG
02223 Pro-Resolving Mediators
00318 Serraflazyme
01203 Specially-Coated Bromelain
00407 Super Bio-Curcumin® Turmeric Extract
01254 Zyflamend™ Whole Body

JOINT SUPPORT

02404 Arthro-Immune Joint Support
02238 ArthroMax® Advanced NT2 Collagen™ & AprèsFlex®
01617 ArthroMax® with Theaflavins & AprèsFlex®
02138 ArthroMax® Elite
00965 Fast-Acting Joint Formula
02430 Fast Acting Relief
00522 Glucosamine/Chondroitin Capsules
02420 Glucosamine Sulfate
02424 Joint Mobility
01600 Krill Healthy Joint Formula
01050 Krill Oil
00451 MSM (Methylsulfonylmethane)
02231 NT2 Collagen™

KIDNEY & BLADDER SUPPORT

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

LIVER HEALTH & DETOXIFICATION

01922 Advanced Milk Thistle • 60 softgels
01925 Advanced Milk Thistle • 120 softgels
02240 Anti-Alcohol Complex
01651 Calcium D-Glucarate
01571 Chlorophyllin
01522 Milk Thistle • 60 veg capsules
02402 FLORASSIST® Liver Restore™
01541 Glutathione, Cysteine & C
01393 HepatoPro
01608 Liver Efficiency Formula
01534 N-Acetyl-L-Cysteine
00342 PectaSol-C® Modified Citrus Pectin Powder
01080 PectaSol-C® Modified Citrus Pectin Capsules
01884 Silymarin
02361 SOD Booster

LONGEVITY & WELLNESS

00457 Alpha-Lipoic Acid
01625 AppleWise
02414 Bio-Fisetin
01214 Blueberry Extract
01438 Blueberry Extract and Pomegranate
02270 DNA Protection Formula
02405 Endocannabinoid System Booster
02431 Essential Youth - L-Ergothioneine
02119 GEROPROTECT® Ageless Cell™
02415 GEROPROTECT® Autophagy Renew
02133 GEROPROTECT® Longevity A.I.™
02401 GEROPROTECT® Stem Cell
02211 Grapeseed Extract
00954 Mega Green Tea Extract (decaffeinated)
00953 Mega Green Tea Extract (lightly caffeinated)
01513 Optimized Fucoidan with Maritech® 926
02230 Optimized Resveratrol
01637 Pycnogenol® French Maritime Pine Bark Extract
02210 Resveratrol
00070 RNA (Ribonucleic Acid)
02301 Senolytic Activator®
01208 Super R-Lipoic Acid
01919 X-R Shield

MEN'S HEALTH

02209 Male Vascular Sexual Support
00455 Mega Lycopene Extract
02306 Men's Bladder Control
01789 PalmettoGuard® Saw Palmetto and Beta-Sitosterol
01790 PalmettoGuard® Saw Palmetto/Nettle Root Formula and Beta-Sitosterol
01837 Pomi-T®
01373 Prelox® Enhanced Sex for Men
01940 Super MiraForte with Standardized Lignans
02500 Testosterone Elite
01909 Triple Strength ProstaPollen™
02029 Ultra Prostate Formula

MINERALS

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

MISCELLANEOUS

00577 Potassium Iodide
00657 Solarshield® Sunglasses

MOOD & STRESS MANAGEMENT

02312 Cortisol-Stress Balance
00987 Enhanced Stress Relief
01074 5 HTP
01683 L-Theanine
02175 SAMe (S-Adenosyl-Methionine) 200 mg, 30 enteric coated vegetarian tablets
02176 SAMe (S-Adenosyl-Methionine) 400 mg, 30 enteric coated vegetarian tablets
02174 SAMe (S-Adenosyl-Methionine) 400 mg, 60 enteric coated vegetarian tablets
02429 Theanine XR™ Stress Relief

MULTIVITAMINS

02199 Children's Formula Life Extension Mix™
02498 Comprehensive Nutrient Packs ADVANCED
02354 Life Extension Mix™ Capsules
02364 Life Extension Mix™ Capsules without Copper
02356 Life Extension Mix™ Powder
02355 Life Extension Mix™ Tablets
02357 Life Extension Mix™ Tablets with Extra Niacin
02365 Life Extension Mix™ Tablets without Copper
02292 Once-Daily Health Booster • 30 softgels
02291 Once-Daily Health Booster • 60 softgels
02313 One-Per-Day Tablets
02428 Plant-Based Multivitamin
02317 Two-Per-Day Capsules • 60 capsules
02314 Two-Per-Day Capsules • 120 capsules
02316 Two-Per-Day Tablets • 60 tablets
02315 Two-Per-Day Tablets • 120 tablets

NERVE & COMFORT SUPPORT

02202 ComfortMAX™
02303 Discomfort Relief

PERSONAL CARE

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

PET CARE

01932 Cat Mix
01931 Dog Mix

PROBIOTICS

01622 Bifido GI Balance
01825 FLORASSIST® Balance
02421 FLORASSIST® Daily Bowel Regularity
02125 FLORASSIST® GI with Phage Technology
01821 FLORASSIST® Heart Health
02250 FLORASSIST® Mood Improve
02208 FLORASSIST® Immune & Nasal Defense
02120 FLORASSIST® Oral Hygiene
02203 FLORASSIST® Prebiotic
01920 FLORASSIST® Throat Health
02400 FLORASSIST® Winter Immune Support
52142 Jarro-Dophilus® for Women
00056 Jarro-Dophilus EPS® • 60 veg capsules
21201 Jarro-Dophilus EPS® • 120 veg capsules
01038 Theralac® Probiotics
01389 TruFlora® Probiotics

SKIN CARE

80157 Advanced Anti-Glycation Peptide Serum
80165 Advanced Growth Factor Serum
80170 Advanced Hyaluronic Acid Serum
80154 Advanced Lightening Cream
80155 Advanced Peptide Hand Therapy
80175 Advanced Probiotic-Fermented Eye Serum
80177 Advanced Retinol Serum
80152 Advanced Triple Peptide Serum
80140 Advanced Under Eye Serum with Stem Cells

80137 All-Purpose Soothing Relief Cream
80139 Amber Self MicroDermAbrasion
80118 Anti-Aging Mask
80151 Anti-Aging Rejuvenating Face Cream
80153 Anti-Aging Rejuvenating Scalp Serum
80179 Brightening Peptide Serum
80176 Collagen Boosting Peptide Cream
80156 Collagen Boosting Peptide Serum
02408 Collagen Peptides for Skin & Joints
80180 CoQ10 and Stem Cell Rejuvenation Cream
80169 Cucumber Hydra Peptide Eye Cream
02423 Daily Skin Defense
80141 DNA Support Cream
80163 Eye Lift Cream
80123 Face Rejuvenating Anti-Oxidant Cream
80109 Hyaluronic Facial Moisturizer
80110 Hyaluronic Oil-Free Facial Moisturizer
80138 Hydrating Anti-Oxidant Facial Mist
00661 Hydroderm
55495 Instensive Moisturizing Cream
80103 Lifting & Tightening Complex
80168 Melatonin Advanced Peptide Cream
80114 Mild Facial Cleanser
80172 Multi Stem Cell Hydration Cream
80159 Multi Stem Cell Skin Tightening Complex
80122 Neck Rejuvenating Anti-Oxidant Cream
80174 Purifying Facial Mask
80150 Renewing Eye Cream
80142 Resveratrol Anti-Oxidant Serum
01938 Shade Factor™
02129 Skin Care Collection Anti-Aging Serum
02130 Skin Care Collection Day Cream
02131 Skin Care Collection Night Cream
80166 Skin Firming Complex
02096 Skin Restoring Ceramides
80130 Skin Stem Cell Serum
80164 Skin Tone Equalizer
80143 Stem Cell Cream with Alpine Rose
80148 Tightening & Firming Neck Cream
80161 Triple-Action Vitamin C Cream
80162 Ultimate MicroDermabrasion
80173 Ultimate Peptide Serum
80178 Ultimate Telomere Cream
80160 Ultra Eyelash Booster
80101 Ultra Wrinkle Relaxer
80113 Under Eye Refining Serum
80104 Under Eye Rescue Cream
80171 Vitamin C Lip Rejuvenator
80129 Vitamin C Serum
80136 Vitamin D Lotion
80102 Vitamin K Cream

SLEEP

01512 Bioactive Milk Peptides
02300 Circadian Sleep
01551 Enhanced Sleep with Melatonin
01511 Enhanced Sleep without Melatonin
02234 Fast-Acting Liquid Melatonin
01669 Glycine
02308 Herbal Sleep PM
01722 L-Tryptophan
01668 Melatonin • 300 mcg, 100 veg capsules
01083 Melatonin • 500 mcg, 200 veg capsules
00329 Melatonin • 1 mg, 60 capsules
00330 Melatonin • 3 mg, 60 veg capsules
00331 Melatonin • 10 mg, 60 veg capsules
00332 Melatonin • 3 mg, 60 veg lozenges
02201 Melatonin IR/XR
01787 Melatonin 6 Hour Timed Release 300 mcg, 100 veg tablets
01788 Melatonin 6 Hour Timed Release 750 mcg, 60 veg tablets
01786 Melatonin 6 Hour Timed Release 3 mg, 60 veg tablets
01721 Optimized Tryptophan Plus
01444 Quiet Sleep
01445 Quiet Sleep Melatonin
02502 Rest & Renew

VITAMINS

01533 Ascorbyl Palmitate
00920 Benfotiamine with Thiamine
00664 Beta-Carotene
01945 BioActive Complete B-Complex
00102 Biotin
00084 Buffered Vitamin C Powder
02229 Fast-C® and Bio-Quercetin Phytosome
02075 Gamma E Mixed Tocopherol Enhanced with Sesame Lignans
02070 Gamma E Mixed Tocopherol & Tocotrienols
01913 High Potency Optimized Folate
01674 Inositol Caps
02244 Liquid Vitamin D3 • 50 mcg (2000 IU)
02232 Liquid Vitamin D3 (Mint) • 50 mcg (2000 IU)
01936 Low-Dose Vitamin K2
00065 MK-7
00373 No Flush Niacin
01939 Optimized Folate (L-Methylfolate)
01217 Pyridoxal 5'-Phosphate Caps
01400 Super Absorbable Tocotrienols
02334 Super K
02335 Super K Elite
01863 Super Vitamin E
02422 Vegan Vitamin D3
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 • 60 veg tablets
02227 Vitamin C and Bio-Quercetin Phytosome • 250 veg tablets
01753 Vitamin D3 • 25 mcg (1000 IU), 90 softgels
01751 Vitamin D3 • 25 mcg (1000 IU), 250 softgels
01713 Vitamin D3 • 125 mcg (5000 IU), 60 softgels
01718 Vitamin D3 • 175 mcg (7000 IU), 60 softgels
01758 Vitamin D3 with Sea-Iodine™
02040 Vitamins D and K with Sea-Iodine™

WEIGHT MANAGEMENT & BODY COMPOSITION

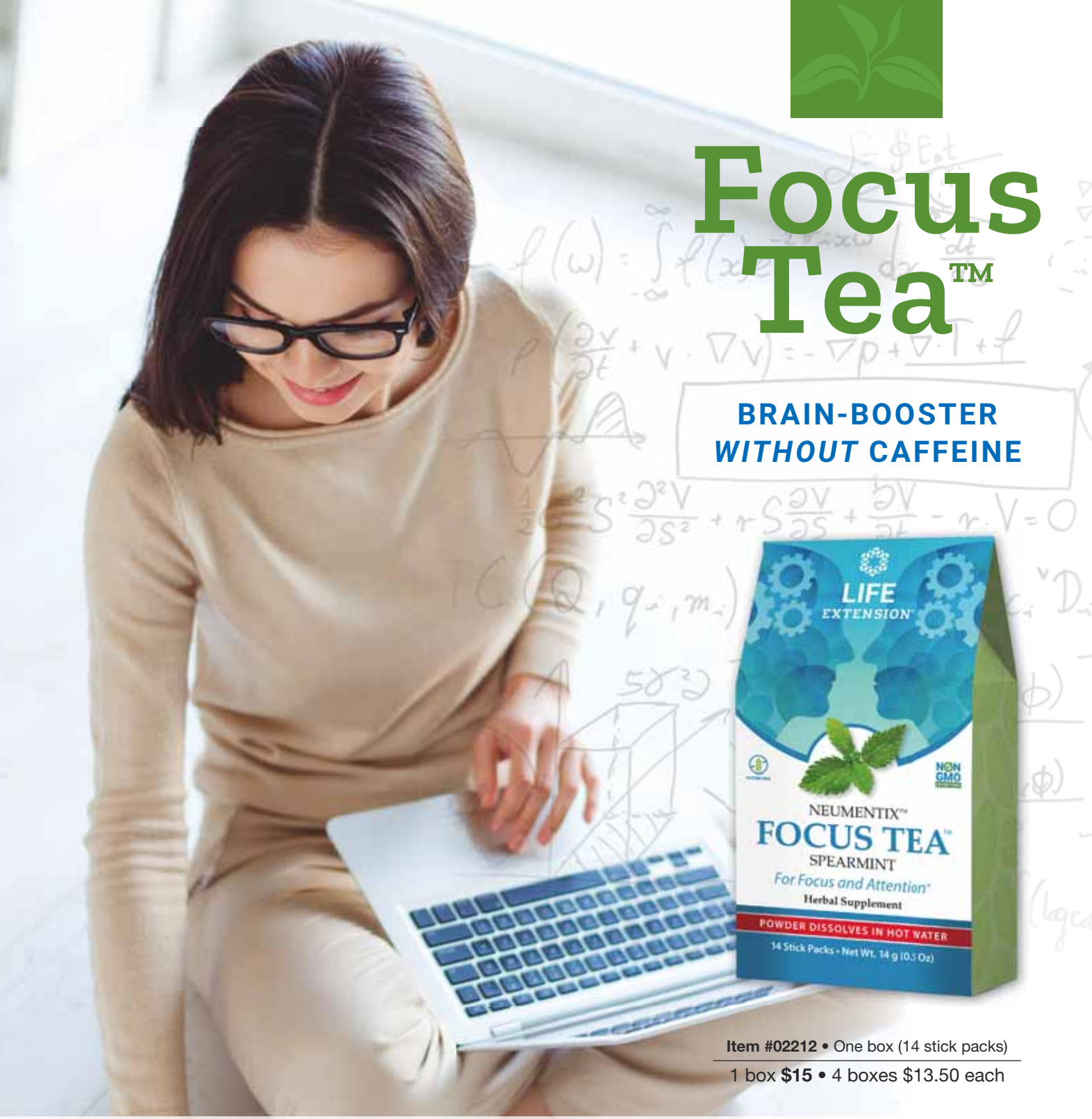
02479 7-Keto® DHEA Metabolite • 100 mg, 60 veg capsules
01807 Advanced Appetite Suppress
02207 AMPK Metabolic Activator
02504 Body Trim and Appetite Control
02478 DHEA Complete
01738 Garcinia HCA
01908 Mediterranean Trim with Sinetrol™ -XPur
01432 Optimized Saffron
00818 Super CLA Blend with Sesame Lignans

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

Focus Tea™

BRAIN-BOOSTER *WITHOUT* CAFFEINE



Item #02212 • One box (14 stick packs)

1 box **$15** • 4 boxes $13.50 each

Spearmint tea has been shown in **human** studies to boost:[1]

- **Mental focus**
- **Working memory**
- **Concentration**

Lab data suggest **spearmint polyphenols** may promote the growth of new **brain cells**.[2]

Just open a packet, pour **Focus Tea™** into hot water, stir, and enjoy. No steeping needed.

GLUTEN FREE

NON GMO LE CERTIFIED

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

Neumentix™ is a trademark of Kemin Industries, Inc.

References

1. *J Altern Complement Med*. 2018;24(1):37-47.
2. Fonseca BA, Herrlinger KA. The effects of a proprietary spearmint extract on neurogenesis rates in rat hippo-campal neurons. Paper presented at: Neuroscience2016; San Diego, CA.

Our Most Complete Omega-3
FISH OIL FORMULA

Super Omega-3 provides higher EPA/DHA potencies PLUS components found in Mediterranean-style diets.

This advanced formula provides:

1. **EPA/DHA Fish Oil**
   (ultra pure/highly concentrated)
2. **Olive polyphenols**
   (to inhibit LDL oxidation)
3. **Sesame lignans**
   (to extend stability of DHA in the blood)
4. **Astaxanthin**
   (protects against lipid peroxidation)
5. **Krill oil**
   (a source of EPA/DHA)

GLUTEN FREE

NON GMO LE CERTIFIED

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

For full product description and to order **Super Omega-3 Plus EPA/DHA Fish Oil**, **Sesame Lignans**, **Olive Extract**, **Krill & Astaxanthin**, call 1-800-544-4440 or visit www.LifeExtension.com

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The Science of a Healthier Life®

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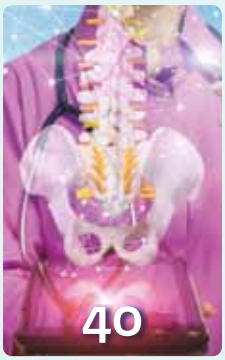

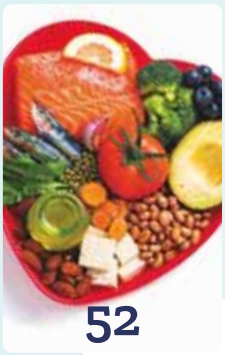

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