FINDING THE RIGHT CATARACT SURGEON

AMPK Reverses Markers Of Aging

Boron Powerfully Lowers Prostate Cancer Risk

Obtain Optimal Selenium Benefits

Metformin Targets Cancer Cells

How Vitamin C Boosts Immunity
Even with cholesterol/glucose levels in the healthy range, aging individuals need to maintain youthful integrity of their endothelium—the thin layer of cells lining the interior of the entire circulatory system.

Based on published studies showing improvements in endothelial function, health-conscious people have been drinking pomegranate juice or taking a standardized pomegranate supplement.

**GOING BEYOND POMEGRANATE**

The addition of CORDIART™ (extract from sweet orange peels) to pomegranate provides another vascular benefit by activating endothelial production of nitric oxide, which signals the smooth muscles to relax, inducing vasodilation to support healthy circulation.

In clinical research, 500 mg of CORDIART™ alone produced an 18% improvement in flow mediated dilation, a direct marker of endothelial function. CORDIART™ also inhibited the pro-inflammatory factors C-reactive protein and serum amyloid A that interrupt healthy nitric oxide production.

**TRIPLE-ACTION PROTECTION**

For those seeking the convenience of three nutrients clinically shown to help with blood flow and age-related changes in endothelial function, the newly formulated Endothelial Defense™ provides:

1) Full-Spectrum Pomegranate™
2) CORDIART™
3) Superoxide dismutase (SOD).

The orally active form of superoxide dismutase (SOD)—called Glisodin®—has been clinically demonstrated to support healthy arterial function and structure, while boosting levels of the body’s protective enzymes—SOD and catalase.

The new Endothelial Defense contains a potent dose of Glisodin® along with 500 mg of CORDIART™.

**Endothelial Defense™ with Full-Spectrum Pomegranate™ and CORDIART™**

Item #01997 • 60 softgels • Non-GMO

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**NitroVasc with CORDIART™**

Item #01990 • Non-GMO

30 500 mg vegetarian capsules

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To order Life Extension® Endothelial Defense™ with Full-Spectrum Pomegranate™ and CORDIART™ or NitroVasc with CORDIART™, call 1-800-544-4440 or visit www.LifeExtension.com

**References**


POMEILLA® Extract is a registered trademark of Verdure Sciences, Inc. Isocell SA, France is the owner of US Patents Nos. 6,045,809 and 6,426,068 and trademark of Glisodin®. CORDIART™ is a trademark of BioActor B.V. Contains wheat.

These statements have not been evaluated by the Food and Drug Administration. These products are not intended to diagnose, treat, cure, or prevent any disease.
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**VOLUME TWENTY ONE / NUMBER ELEVEN • November 2015**

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### 32  BORON TARGETS PROSTATE CANCER

Compelling evidence indicates that the trace mineral boron plays an important role in protecting men against deadly prostate cancer by selectively killing prostate cancer cells while leaving healthy cells unharmed. Adequate boron levels are associated with a 64% reduced risk of prostate cancer as well as a reduction in PSA levels.

### 42  HOW TO OBTAIN OPTIMAL SELENIUM BENEFITS

By protecting DNA, eliminating toxins, boosting immunity, and optimizing thyroid function, the proper forms of selenium have been shown to impede heart disease, certain cancers, immune senescence, and premature death.

### 56  VITAMIN C’s VITAL LINK TO IMMUNITY

Most animals internally synthesize high amounts of vitamin C. Humans lack this ability and are entirely dependent on dietary or supplement ascorbate sources to remain alive. In addition to its vital role in maintaining the body’s collagen structure, vitamin C augments numerous components of the immune system.

### 68  IMPROVE YOUR ODDS OF SUCCESSFUL CATARACT SURGERY

To avoid being among the 15,000 who have serious complications from cataract surgery, including blindness, it is important to learn how to select your eye surgeon. In addition, we include a tragic, first-person account of a routine cataract surgery that left the author blind in one eye. The intent of this article is to help you avoid becoming a statistic.

### 70  RESTORE YOUTHFUL FACIAL CONTOUR

The effects of gravity and sun exposure break down elastin and collagen, resulting in your skin’s loss of resilience and firmness. A newly identified peptide triggers new production of elastin and collagen, while three extracts suppress free radicals, block UV damage, and boost the moisture in your skin by 51%—for more defined, younger-looking skin.

### 88  REPORT: MICROBIOME OF AGING AND AGE-RELATED DISEASE CONFERENCE

At the world’s first microbiome conference, scientists presented compelling new information on microbial cells and their critical effects on disease and aging. Topics included the Human Microbiome Project, chronic inflammation, colon bacteria, dietary impact, and probiotics and prebiotics.

### 18  AMPK AND AGING

A growing body of evidence suggests that boosting AMPK activity can prevent and even reverse, the life-shortening effects of aging. Insufficient AMPK activity may be related to virtually all pathological aging processes. Research indicates that restoring AMPK not only increases longevity, but works to fight the symptoms of aging in individual body systems.

## DEPARTMENTS

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• Personal Consultation with Life Extension
• Blood Testing and Analysis

Any dietary, drug, exercise, or other lifestyle change intended to prevent or treat a specific disease or condition should first consult with and seek clearance from a qualified healthcare professional.

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Nutrition Center of Florida, Inc.
MAGNESIUM BOOSTS BRAIN HEALTH

Profound shrinkage of \textit{synaptic connections} between nerve cells is one of the major hallmarks associated with brain aging. \textbf{Magnesium} is a critical factor in controlling \textit{synaptic density} in the brain.\textsuperscript{1}

An innovative form of magnesium called \textbf{Neuro-Mag\textsuperscript{®}} has been shown to specifically target multiple areas of the aging brain. In fact, preclinical models show that the \textit{magnesium-L-threonate} contained in \textbf{Neuro-Mag\textsuperscript{®}} boosted levels of magnesium in spinal fluid by 15\% versus no increase from conventional magnesium.\textsuperscript{2} This means that this form of \textit{magnesium} is passing through the blood-brain barrier for assimilation into the brain.

\textbf{Comprehensive Cognitive Benefits}

Scientists continue to uncover magnesium's comprehensive benefits for cognitive function.\textsuperscript{3} Studies using \textit{magnesium-L-threonate} show this unique form of magnesium maintains the quantity of \textit{synaptic} connections between brain cells and inhibits the dysregulation of signaling pathways.\textsuperscript{1}

\textbf{Neuro-Mag...Capsules Or Powder}

The suggested daily dose of three \textbf{Neuro-Mag\textsuperscript{®}} capsules provides 2,000 mg of \textit{Magnesium-L-Threonate}. While supplying a modest 144 mg of elemental magnesium, its superior absorption into the bloodstream and nervous system make it a preferred choice for maturing individuals to supplement with.

This same brain-health supporting magnesium is also available in a powder called \textbf{Neuro-Mag\textsuperscript{®} Magnesium-L-Threonate with Calcium and Vitamin D3}. In addition to its fresh lemon flavor, the one-scoop-per-day serving supplies the same amount of magnesium as the capsules, plus 500 mg of highly soluble calcium and 1,000 IU of vitamin D3.

References

Gustavo Tovar Baez, MD, operates the Life Extension Clinic in Caracas, Venezuela. He is the first physician in Caracas to specialize in anti-aging medicine.

Ricardo Bernales, MD, is a board-certified pediatrician and general practitioner in Chicago, IL, focusing on allergies, bronchial asthma, and immunodeficiency.

Mark S. Bezzek, MD, FACP, FAARM, FAAEM, is board certified in internal medicine, emergency medicine, and anti-aging/regenerative medicine. He is the director of Med-Link Consulting, which specializes in bioidentical hormone replacement therapy, natural alternatives, anti-aging, and degenerative diseases. He holds US patents for a multivitamin/mineral supplement, an Alzheimer’s/dementia compilation, and a diabetic regimen.

Anna M. Cabeca, DO, FACOG, ABAARM, is a board certified Gynecologist and Obstetrician, as well as board certified in Anti-Aging and Regenerative Medicine, an expert in Functional Medicine, and an expert in women’s health. She specializes in bioidentical hormone replacement therapy and natural alternatives, successful menopause and age management medicine.

Thomas F. Crais, MD, FACS, a board-certified plastic surgeon, was medical director of the microsurgical research and training lab at Southern Baptist Hospital in New Orleans, LA, and currently practices in Sun Valley, ID.

William Davis, MD, is a preventive cardiologist and author of Wheat Belly: Lose the Wheat, Lose the Weight and Find Your Path Back to Health. He is also medical director of the online heart disease prevention and reversal program, Track Your Plaque (www.trackyourplaque.com).

Martin Dayton, MD, DO, practices at the Sunny Isles Medical Center in North Miami Beach, FL. His focus is on nutrition, aging, chelation therapy, holistic medicine, and oxidative medicine.

John DeLuca, MD, DC, is a 2005 graduate of St. George’s University School of Medicine. He completed his Internal Medicine residency at Monmouth Medical Center in Long Branch, NJ, in 2008 and is board certified by the American Board of Internal Medicine. Dr. DeLuca is a Diplomate of the American Academy of Anti-Aging Medicine and has obtained certifications in hyperbaric medicine, pain management, nutrition, strength and conditioning, and manipulation under anesthesia.

Sergey A. Dzugan, MD, PhD, was formerly chief of cardiovascular surgery at the Donetsk Regional Medical Center in Donetsk, Ukraine. Dr. Dzugan’s current primary interests are anti-aging and biological therapy for cancer, cholesterol, and hormonal disorders.

Patrick M. Fratelonne, MD, RH, is the founder and executive medical director of Fratelonne Associates. He completed his Internal Medicine and Cardiology Fellowship at Lenox Hill Hospital in 1994, before becoming the medical director for the Atkins Center for Complementary Medicine.

Carmen Fusco, MS, RN, CNS, is a research scientist and clinical nutritionist in New York City who has lectured and written numerous articles on the biochemical approach to the prevention of aging and degenerative diseases.

Norman R. Gay, MD, is proprietor of the Bahamas Anti-Aging Medical Institute in Nassau, Bahamas. A former member of the Bahamian Parliament, he served as Minister of Health and Minister of Youth and Sports.

Mitchell J. Ghen, DO, PhD, holds a doctorate in holistic health and anti-aging and serves on the faculty of medicine at the Benemérita Universidad Autónoma De Puebla, Mexico, as a professor of cellular hematopoietic studies.

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Ross Pelton, RPh, PhD, CCN, is director of nutrition and anti-aging research for Intramedicine, Inc.

Patrick Quillin, PhD, RD, CNS, is a clinical nutritionist in Carlsbad, CA, and formerly served as vice president of nutrition for Cancer Treatment Centers of America, where he was a consultant to the National Institutes of Health.

Allan Rashford, MD, graduated from the University of Iowa Medical School. Upon completing medical training, he became chief of medicine at St. Francis Hospital in South Carolina, and he was later named president of the Charleston Medical Society.

Marc R. Rose, MD, practices ophthalmology in Los Angeles, CA, and is president of the Rose Eye Medical Group. He is on the staffs of Pacific Alliance Medical Center, Los Angeles, and other area hospitals.

Michael R. Rose, MD, is a board-certified ophthalmologist with the Rose Eye Medical Group in Los Angeles, CA, and is on the staffs of the University of Southern California and UCLA.

Ron Rothenberg, MD, is a full clinical professor at the University of California San Diego School of Medicine and founder of California HealthSpan Institute in San Diego, CA.

Roman Rozencwaig, MD, is a pioneer in research on melatonin and aging. He practices in Montreal, Canada, as research associate at Montreal General Hospital, Department of Medicine, McGill University.

Michael D. Seidman, MD, FACS, is the director of otorhinolaryngology-head and neck surgery for the Bloomfield satellite of Henry Ford Health System (HFHS), Detroit, MI, co-director of the Tinnitus Center, and co-chair of the Complementary/Alternative Medicine Initiative for HFHS.

Ronald L. Shuler, BS, DDS, CCN, LN, is involved in immunoncology for the prevention and treatment of cancer, human growth hormone secretagogues, and osteoporosis. Board certified in Anti-Aging medicine.

Paul Wand, MD, Fort Lauderdale, FL, is a clinical neurologist with special expertise in treating and reversing diabetic peripheral neuropathy and brain injuries from various causes.
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.

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 obtained 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 anticancer drugs. He conducted his postdoctoral training at Stanford University Department of Statistics. He is currently president of New Earth BioMed, a nonprofit cancer research corporation that studies mixtures of natural products.

Frank Eichorn, MD, is a urologist specializing in prostate cancer for 10 years. He has a private practice in Bad Reichenhall, Germany, and is prostate cancer consultant at the Urologische Klinik Castringius, Planegg, Munich. In his integrative approach to prostate cancer he is working together with an international network of experts to improve treatment outcomes for prostate cancer patients with a special focus on natural and translational medicine.

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 new University of Central Florida Medical School.

Steven B. Harris, MD, is president and director of research at Critical Care Research, a company that grew out of 21st Century Medicine in Rancho Cucamonga, CA. Dr. Harris participates 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), FRCP (Edin.), FACP Dr. Dipnarine Maharaj is the Medical Director of the South Florida Bone Marrow Stem Cell Transplant Institute 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.

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 11 books and publishes Nutrition and Healing, a monthly newsletter with a worldwide circulation of more than 100,000.

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 XTherma Inc., a company developing a radical new highway towards nontoxic, hyper-effective antifreeze agents to fight unwanted ice formation in regenerative medicine and reduce mechanical icing.
Over 6,000 studies have been published on resveratrol, a compound shown to favorably alter genes that help slow the aging process. In fact, resveratrol triggers some of the same beneficial youthful gene expression activated by calorie restriction.¹

Optimized Resveratrol with NAD+ Cell Regenerator contains NIAGEN® nicotinamide riboside, a novel nutrient shown to support mitochondrial health and promote longevity pathways. This formula provides 100 mg of NIAGEN® nicotinamide riboside—an amount equivalent to almost 667 cups of milk!²

Optimized Resveratrol with NAD+ Cell Regenerator also contains specific compounds in berries, such as pterostilbene and fisetin, which researchers say work in synergy with resveratrol to “turn on” the body’s own longevity genes.

Just one capsule of Optimized Resveratrol with NAD+ Cell Regenerator supplies:

- Trans-Resveratrol 250 mg
- NIAGEN® Nicotinamide Riboside 100 mg
- Grape Berry Actives 40 mg
- Quercetin 60 mg
- Trans-Pterostilbene (from pTeroPure®) 0.5 mg
- Fisetin 10 mg

The suggested dose is one capsule daily of this resveratrol formula.

Non-GMO
NIAGEN® and pTeroPure® are registered trademarks of ChromaDex, Inc.

To order Optimized Resveratrol with NAD+ Cell Regenerator, call 1-800-544-4440 or visit www.LifeExtension.com

References

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An article in the *Wall Street Journal* describes a group of academic researchers who are seeking to initiate a human study where a single pill will be tested to see if it will prevent or delay the most debilitating diseases of aging.1

These top-level scientists describe findings from published studies that support the anti-aging effects of this single drug. These researchers boldly proclaim:

“Aging is the major risk factor for all these diseases—heart disease, cancer, diabetes, and Alzheimer’s... If you want to make a real impact you have to modulate the risk of aging and by that the risk for all those diseases of aging.”

What makes the above statement so unique is that today’s medical mainstream does not recognize aging as a disease. This conventional view is changing, however, as prominent scientists’ state that “fighting every major disease of old age is not a winnable strategy.”2 They argue that if:

“We lower the risk of heart disease, somebody lives long enough to get cancer. If we reduce the risk of cancer, somebody lives long enough to get Alzheimer’s disease... We are suggesting that the time has arrived to attack them all by going after the biological process of aging.”2

In case you haven’t guessed it by now, the “pill” these scientists want to test in a human anti-aging study is the AMPK-activating drug *metformin*.

If you go back to the March 1995 issue of this magazine, you’ll see *metformin* listed in a group of recommended offshore anti-aging therapies. We were harshly persecuted by the FDA for daring to do this. We’ve since published dozens of articles urging members to ask their doctor to prescribe *metformin* to prevent age-related disease.

Those not able to secure a physician’s prescription learned last year of AMPK-activating nutrients that compared favorably to *metformin* in side-by-side research.3

The mainstream and even the FDA may finally be catching on to the deadly impact of loss of AMPK activity. It’s a shame that it has taken 20 years for researchers to want to initiate a human study of the anti-aging properties of metformin. The scientific data has been so clearly evident for so long.

Widespread use of AMPK-activating compounds could be a game-changing breakthrough that, as the *Wall Street Journal* stated could, “increase the number of years of healthy, independent living.”1

The first article in this month’s edition describes the profound age-delaying and age-reversing effects that occur in response to activating one’s cellular AMPK.

This month’s issue also features eye-opening reports about newly discovered benefits of boron and selenium. The good news is that most readers of this magazine have been obtaining optimal forms of these minerals for many years.

The recognition of the age-delaying benefits of *metformin* is a major vindication of *Life Extension*’s long-standing position for people to take AMPK-activating compounds to extend their healthy life spans.

For longer life,

William Faloon

References
THE MOST COMPLETE PROSTATE PROTECTION

Ultra Natural Prostate formula provides the latest scientifically validated botanical extracts shown to promote healthy prostate function.

No other prostate protection formula provides such a broad array of nutrients to support the multiple factors involved in the health of the aging prostate gland. Ultra Natural Prostate contains:

- **Standardized lignans** provide support for prostate cells against excess estrogen levels.1,3
- **AprèsFlex®** supports normal inhibition of 5-lipoxygenase or 5-LOX, an enzyme associated with undesirable cell division changes.4-6
- **Stinging and Dwarf nettle root extracts** help support prostate cells against excess estrogen levels.6,7
- **Saw Palmetto CO2 extract** helps support dihydrotestosterone (DHT) activity in the prostate, helps support normal urinary flow, and helps regulate inflammatory reactions in the prostate.8,11
- **Pygeum** extract helps suppress prostaglandin production in the prostate and supports healthy urination patterns.5,13
- **Pumpkin seed oil** enhances the composition of free fatty acids and augments saw palmetto’s benefits.1,2
- **Beta-sitosterol** enhances the protective effects of other botanical extracts and helps improve quality of life.12-13
- **Graminex® Flower Pollen Extract™**, has been shown to help relax the smooth muscles of the urethra and help regulate inflammatory reactions.20-22
- **Boron** has been shown to slow elevation of prostate-specific antigen (PSA).23-24
- **Lycopene** supports efficient cellular communication, helps maintain healthy DNA, regulates hormonal metabolism, and promotes healthy prostate size and structure.25-32
- **Phospholipids** enhance absorption of active compounds.

Ultra Natural Prostate Item #01898 • 60 softgels

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<td>$26.25 each</td>
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The suggested daily dose of two softgels of Ultra Natural Prostate provides:

- **Saw Palmetto CO2 extract** (fruit) [providing 272 mg total fatty acids] 320 mg
- **Graminex® Flower Pollen Extract™** (from rye) 252 mg
- **Stinging and Dwarf nettle extracts** (root) 240 mg
- **Beta-Sitosterol** 180 mg
- **Phospholipids** 160 mg
- **Pygeum extract** (bark) 100 mg
- **Pumpkin seed oil** [providing 170 mg total fatty acids] 200 mg
- **Boron** (as Albion® bororganic glycine) 10 mg

To order Ultra Natural Prostate, call 1-800-544-4440 or visit www.LifeExtension.com

These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease.
Found in every cell, AMPK promotes longevity factors that have been shown to extend life span in numerous organisms. Increasing AMPK signaling “turns off” many damaging effects of aging, thus enabling cells to return to a more youthful vitality. AMPK Activator is a specialized dual-extract formulation that facilitates AMPK activation for health optimization.

Importance Of AMPK

Studies show increased AMPK activity supports reduced fat storage, new mitochondria production, and the promotion of healthy blood glucose and lipids already within normal range. An extract of the plant Gynostemma pentaphyllum promotes AMPK activation. In one of many studies showing a wide variety of benefits, researchers documented a 1-inch reduction in abdominal circumference in overweight individuals who took 450 mg daily of G. pentaphyllum extract for 12 weeks. Trans-tiliroside, extracted from plants such as rose hips, boosts AMPK activation, but triggers different downstream metabolic benefits than G. pentaphyllum. Among its many benefits, a low equivalent dose of 56 mg daily trans-tiliroside has been shown by researchers in preclinical studies to promote healthy blood glucose levels and body weight already within normal range.

Major Anti-Aging Discovery

The suggested daily dosage of AMPK Activator is two capsules with the first meal of the day and one capsule with the second meal. Three capsules provide:

<table>
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<th>ActivAMP®</th>
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<tr>
<td>Gynostemma pentaphyllum extract</td>
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<tr>
<td>Rose hip extract</td>
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<td>Standardized to 5% trans-tiliroside</td>
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Other Methods Of Boosting AMPK

Those practicing aggressive calorie restriction, taking more than 1,000 mg/day of the drug metformin, or are regularly/vigorously exercising (and under age 60) may not need AMPK Activator. The reason is that persistent calorie restriction, metformin and/or exercise under age 60 may adequately boost AMPK activity.

To order AMPK Activator, call 1-800-544-4440 or visit www.LifeExtension.com

These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease.
Fat-Soluble Nutrients Missing From Most Multi-Vitamin Formulas

Life Extension’s Health Booster is a cost-effective formula that combines a variety of valuable nutrients in just one softgel. Once-Daily Health Booster provides the following nutrients:

Vitamin K1 is found in plants. It is often bound to plant fiber and requires intestinal conversion to transform into bioactive vitamin K2. Data supports value of K1 in addition to the K2 forms.4,7

Vitamin K2 is the active form that keeps calcium in bone and out of arteries. MK-4 is rapidly absorbed,1-5,6 while MK-7 provides 24-hour bioavailability of vitamin K2.9

Trans-zeaxanthin, meso-zeaxanthin, and lutein supports eye health and healthy vision.

Gamma tocopherol is a form of vitamin E that quenches the damaging peroxynitrite free radical.9,10 Those who take alpha-tocopherol should also take gamma tocopherol.

Blueberry extract boosts DNA repair and sustain healthy blood sugar levels already within normal range.12,13

Sesame lignans increases tissue levels of gamma tocopherol, which plays a pivotal role in quenching certain kinds of inflammation.14

Lycopene supports prostate health, protect against free radical activity, and guard against LDL oxidation.15,16

Chlorophyllin offers protection against environmentally induced DNA damage from toxins like smoke, emission particles, and foods cooked at high temperatures.17

Black currant extract (C3G) anthocyanins promotes eye health and help ease eye fatigue.18

Vitamin B12 helps maintain a healthy nervous system and metabolism.19 Vitamin B12 levels decrease with age.20

Each Bottle Of Health Booster Lasts Two Months

Super Cost Effective!
Just one softgel of the new Health Booster taken with a meal provides optimized potencies of fat-soluble vitamins, carotenoids, and other plant extracts. If these nutrients were taken separately, one would have to swallow many capsules and spend 2-3 times more money.

To order Once-Daily Health Booster, call 1-800-544-4440 or visit www.LifeExtension.com

One Daily Health Booster softgel provides:

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Quantity</th>
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<tbody>
<tr>
<td>Vitamin K1</td>
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<tr>
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<tr>
<td>Vitamin B12</td>
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<td>Chlorophyllin</td>
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<td>Gamma E Mixed Tocophorols</td>
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<td>Gamma tocopherol 197.45-269.25 mg</td>
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<tr>
<td>Wild Blueberry Whole Extract</td>
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Contains soybeans.

Caution: If taking anticoagulant or antiplatelet medication, consult your health care provider before taking this product.

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Subnormal Selenium Levels Linked With Increased Mortality

The European Journal of Clinical Nutrition reported an association between decreased serum selenium levels and a greater risk of mortality in an older population over a period of 6.8 years.*

The study included 449 older men and women who participated in an epidemiologic project in southeast Sweden. Serum selenium levels were measured upon enrollment in January 2003 and in 98 subjects after 48 months.

Through February 2010, there were 122 deaths from all causes, including 85 that were attributable to cardiovascular disease. Among those whose selenium levels were among the lowest quartile of subjects, there was an adjusted 43% increase in the risk of dying from any cause and a 56% increased risk of cardiovascular mortality in comparison with the remainder of the study population that had higher serum selenium levels.

Editor’s Note: “This result may suggest the value of modest selenium supplementation in order to improve the health of the Swedish population,” the authors conclude.


Weight Loss Plus Vitamin D Lowers Inflammation

The July 2015 issue of Cancer Prevention Research reports the findings of a randomized, placebo-controlled trial of overweight postmenopausal women, which uncovered a reduction in inflammation in response to weight loss and supplementation with vitamin D.*

Participants in the study, whose serum 25-hydroxyvitamin D levels were lower than 32 ng/mL upon enrollment, were assigned to a five-day-per-week exercise program combined with a low-calorie diet supplemented with 2,000 IU (international units) vitamin D per day or a placebo for one year. Blood samples collected at the beginning and end of the study were assessed for markers of inflammation and other factors.

Although changes in body mass index and other factors were similar between the groups, for those who lost 5 to 10% of their weight, the decline in the inflammatory cytokine interleukin-6 was significantly greater among those who received vitamin D compared to those who received a placebo.

Editor’s Note: “It is thought that this state of chronic inflammation is pro-tumorigenic, that is, it encourages the growth of cancer cells,” commented lead author Catherine Duggan, PhD. “Weight loss reduces inflammation, and thus represents another mechanism for reducing cancer risk. If ensuring that vitamin D levels are replete, or at an optimum level, can decrease inflammation over and above that of weight loss alone, that can be an important addition to the tools people can use to reduce their cancer risk.”

IN THE NEWS

Breast Cancer, Chemotherapy Connected To Weight Gain

Breast cancer survivors are more likely to gain weight over a four-year period than women who have not had cancer, especially if they were treated with chemotherapy, according to a study by researchers at Johns Hopkins Kimmel Cancer Center.

For the study, published in the journal Cancer Epidemiology, Biomarkers & Prevention, the researchers reviewed a baseline questionnaire and a follow-up one completed four years later by 303 breast cancer survivors and 307 cancer-free women.*

In the four-year span, survivors gained more weight—an average of 3.6 pounds—than cancer-free women. Among 180 survivors diagnosed with cancer during the last five years of the study period, 21% gained at least 11 pounds over a four-year period compared with 11% of their cancer-free peers. The weight change findings remained the same after accounting for other factors associated with weight gain, such as increasing age, transition to menopause, and level of physical activity.

Women who had completed chemotherapy within five years of the study were 2.1 times as likely as cancer-free women to gain at least 11 pounds during the study.

Editor’s Note: The authors do not suggest patients worry about weight gain intervention during chemotherapy. “But we are suggesting that oncologists, internists, or anyone treating breast cancer survivors, including those with a family history of the disease, could help them monitor their weight over the long term,” they add.

* Cancer Epidemiol Biomarkers Prev. 2015 July 15.

New Studies Show Metformin Is Indicated As A Potential Anticancer Drug

Numerous studies provide evidence of the anticancer effect of metformin.* A recent review published in PLOS One found an association between the diabetes medication and a significant reduction in the risk of colorectal, liver, pancreatic, stomach, and esophagus cancers in patients with myotonic dystrophy type II, an inherited disorder of the muscles and other body systems. A further study published in Cancer Prevention Research found that low doses of 250 mg per day of metformin administered for four weeks to nondiabetic patients suppressed markers for colorectal cancer.

Metformin may impact cancer through indirect (insulin-dependent) and/or direct (insulin-independent) mechanisms. Metformin reduced lung tumor development primarily through an insulin-dependent mechanism by decreasing circulating levels of insulin-like growth factor-I (IGF). IGF activates its receptor, which in addition to a metabolic effect promotes proliferation and metastasis. The direct-insulin independent antitumor action of metformin is mainly induced by activating the AMPK signaling pathway, resulting in an inhibition of the mammalian target of rapamycin (mTOR), a signaling pathway that plays a central role in cancer cell growth, proliferation, and pathogenesis.

The effects of metformin as a breast cancer target have been studied extensively. A study published in Cancer Research found that metformin targets cancer stem cell (tumor-initiating cells) in four genetically different kinds of breast cancer cell lines. Treatment with a low-dose of metformin was found to eliminate cancer stem cells, possibly due to the inhibition of the inflammatory pathway. This observation could be the definitive link between the diabetic drug and its anticancer benefits, since inflammation plays a key role in both diseases.

Editor’s Note: Life Extension® Magazine has been reporting on the benefits of metformin since the early 1990s. While metformin has been available for use in Europe since the 1950s, the drug was not approved by the FDA for use in the United States until 1994.

* Curr Cancer Drug Targets. 2015 Dec;15(1).

Resveratrol, Quercetin Could Improve Safety Of Cancer Drug

Findings described in the Journal of Controlled Release suggest that the polyphenols resveratrol and quercetin could help improve the safety of Adriamycin (doxorubicin), an effective but potentially cardiotoxic chemotherapy.* Adriamycin’s mechanism of cardiotoxicity involves reactive oxygen and nitrogen species generation, a phenomenon that is reduced by free radical scavengers such as these plant-derived compounds.

Using a system involving polymeric micelles to improve bioavailability, Adam Alani of Oregon State University’s College of Pharmacy and associates first tested the compounds in human ovarian cancer cells and rat heart muscle cells. While Adriamycin was antagonistic toward heart cells, resveratrol and quercetin decreased the activity of caspasases (protein-degrading enzymes) involved in apoptosis (programmed cell death) in these cells while not interfering with Adriamycin’s caspase activity in cancerous cells. Reactive oxygen species generated in both cell lines were reduced by resveratrol and quercetin only in the heart muscle cells.

Editor’s Note: When the combo was tested in mice, resveratrol and quercetin were shown to confer full cardioprotection.

**Depression Higher In Men With Borderline Testosterone Levels**

An article that appeared in the *Journal of Sexual Medicine* reports the findings of researchers at George Washington University of a greater risk of depression and depressive symptoms in men with borderline testosterone levels.*

“In an era where more and more men are being tested for ‘low T’—or lower levels of testosterone—there is very little data about the men who have borderline low testosterone levels,” observed lead researcher Michael S. Irwig, MD.

Dr. Irwig and his associates analyzed data from 200 men between 20 to 77 years of age who were referred for tertiary care for testosterone levels ranging from 200 to 350 ng/dL. Patient Health Questionnaire scores were used to determine the presence of depressive symptoms.

The study results showed that, compared with the general population, men with borderline testosterone levels had a significantly higher rate of depression than the general population (56% versus 23%). Analysis showed that the study participants had higher rates of obesity and lower rates of physical activity than men in the general population. Study subjects also suffered from erectile dysfunction, decreased libido, fewer morning erections, low energy, and sleep disturbances.

Rates of depression were 62% for study participants in their 20s and 30s, 65% for those in their 40s, 51% for those in their 50s and 45% for those age 60 and over.

**Editor’s Note:** “Clinicians should consider screening for depression/depressive symptoms and overweight and unhealthy lifestyle risk factors in men referred for tertiary care for potential hypogonadism,” the authors conclude. Life Extension has long urged aging men to consider maintaining total testosterone levels in the range of 700-900 ng/dL, which is where younger, healthier men normally are.

*J Sex Med. 2015 Jun 30.*

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**Making More Transplantable Organs Available**

According to the World Health Organization, organ transplants are meeting less than 10% of the global need. In the United States, critical shortages of kidneys, hearts, and livers for transplant result in huge numbers of needless deaths.

The Life Extension® Foundation funds a fulltime research project to perfect organ preservation so that more organs will be available for transplant. Cryobiologists at a laboratory funded by Life Extension®—21st Century Medicine—have made an important advance in kidney cryopreservation.*

A common way to measure some aspects of kidney function is to measure an animal’s (or human’s) creatinine level in its blood. Creatinine is a waste product of muscle metabolism, and accumulates in the blood when the kidney is not functioning well. Kidney tubules (nephrons) excrete creatinine as an extended network of small, tissue conduits that filter and reabsorb various blood components. Because they are so small and sensitive to damage, the nephrons of the kidney must be very carefully cryopreserved so as to avoid freezing and thawing damage from ice formation. When the nephrons are damaged, one way to notice this damage is to observe a high level of creatinine in the blood.

Cryobiologists at 21st Century Medicine have recently made significant progress in kidney cryopreservation by making new refinements in their cryopreservation protocols. Previously, cutting-edge techniques for protecting kidneys from ice formation resulted in levels of creatinine in the blood of animals receiving transplants of protected kidneys that were at the borderline of acceptable function, and only 75% of the kidneys fully survived the procedure. This indicated that these previously used protocols were encouraging, but still caused undesirable levels of kidney damage.

By further refining their protocols, researchers have substantially lowered the peak creatinine in these animals receiving cryoprotected kidneys. Moreover, these improvements to their protocols substantially reduced the amount of recovery time required for these transplanted kidneys to restore normal creatinine levels. This was accomplished in as little as eight days post-operation, which is shorter than the time many human kidneys require to function after transplantation today. Post-transplant, a low peak creatinine, combined with a relatively short recovery time to normal creatinine, suggest the kidneys were minimally damaged by the cryoprotection protocol, and much (or all) of that damage was quickly repaired once transplanted into an otherwise healthy animal. Just as importantly, as the peak creatinine goes down, the chance of a kidney not surviving also goes down, and so far, all kidneys have fully survived the procedure.

These kinds of advances may lead to the development of organ banks where tissue-typed matched donor kidneys and other organs will be stored and made available to all people in need, just as blood banks provide this lifesaving function today. According to the Organ Preservation Alliance, being able to bank lungs and hearts could eliminate the current waiting list for these organs in two to three years or less, and being able to bank kidneys could increase the effective supply of kidneys by more than 25%. Currently in the US, there are more deaths from organ failure than from cancer and the global cost of end-stage renal disease has been estimated at $1 trillion per decade.

Increased Vitamin C Linked To Reduced Risk Of Early Mortality

The American Journal of Clinical Nutrition published findings from researchers at the University of Copenhagen of a lower risk of cardiovascular disease and premature death in association with increases in plasma vitamin C and fruit and vegetable intake.*

The investigators analyzed data from 87,030 men and women enrolled in the Copenhagen General Population Study and 10,173 participants in the Copenhagen City Heart Study. Plasma vitamin C levels were measured in 3,512 newly recruited subjects and dietary intake data was available for 83,256 subjects.

Ischemic heart disease was documented in 10,123 individuals and there were 8,477 deaths over the studies’ follow-up periods. “We can see that those with the highest intake of fruit and vegetables have a 15% lower risk of developing cardiovascular disease and a 20% lower risk of early death compared with those who very rarely eat fruit and vegetables,” reported lead author Camilla Kobylecki.

Editor’s Note: “At the same time, we can see that the reduced risk is related to high vitamin C concentrations in the blood from the fruit and vegetables,” Dr. Kobylecki added.


Minimum Vitamin D Dose Inadequate For Overweight African Americans

On July 4, 2015, the journal BioMed Central Obesity published the results of a trial of overweight and obese African Americans that revealed a failure of the Institute of Medicine’s recommended minimum daily dose of vitamin D to elevate serum levels to a healthy range after 16 weeks of treatment.*

The trial included 70 overweight or obese African Americans between the ages of 13 to 45 years with 25 hydroxyvitamin D levels of 20 ng/mL or lower. Participants were randomized to groups that received a placebo or a monthly dose equivalent to 600 IU (international units), 2,000 IU, or 4,000 IU vitamin D per day for 16 weeks.

While the two higher doses were successful at restoring serum vitamin D levels to 30 ng/mL or more at 16 weeks, those who were given the lowest dose failed to achieve this level.

Editor’s Note: In contrast, participants in the 2,000 and 4,000 IU equivalent group reached a serum level of 30 ng/mL as early as eight weeks. Life Extension has long recommended that optimal 25-hydroxyvitamin D levels are in the range of 50-80 ng/mL.

* BMC Obes. 2014 Jul 4.

Aging Switch Located

Reducing many of the effects of aging might be something as simple as the flip of a switch, according to a report published on July 23, 2015, in Molecular Cell.*

Research conducted at Northwestern University found that the heat shock response, which is essential for proper protein formation and cellular health, declined steeply over a period of hours that coincided with the onset of reproductive maturity in C. elegans (a roundworm used in aging experiments) due to the activation of a genetic switch. The switch is conserved in humans and other animals, making it a target for aging research.

By blocking germline cells from sending the signal, Richard I. Morimoto and Jonathan Labbadia found that the tissues of adult animals remained stress resistant. “We had, in a sense, a super stress-resistant animal that is robust against all kinds of cellular stress and protein damage,” Dr. Morimoto reported.

Editor’s Note: “C. elegans has told us that aging is not a continuum of various events, which a lot of people thought it was,” Dr. Morimoto commented. “In a system where we can actually do the experiments, we discover a switch that is very precise for aging. All these stress pathways that ensure robustness of tissue function are essential for life, so it was unexpected that a genetic switch is literally thrown eight hours into adulthood, leading to the simultaneous repression of the heat shock response and other cell stress responses.”

* Mol Cell. 2015 July 23.
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This unique formula includes phosphatidylcholine, a nutrient that promotes better absorption of all the health-providing benefits of milk thistle extract.³

European Milk Thistle Advanced Phospholipid Delivery, with 480 mg of silymarin, is a unique complex that is absorbed nearly 5 times better than silymarin alone, and its concentration in the liver is 10 times better.

References:

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• Supports retinal capillaries and helps maintain healthy eyesight
• Supports healthy blood sugar levels and cellular metabolism of sugar

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The notion that we “die of old age” is a common and misleading myth of modern medicine.

We die not of old age, but of cumulative failures within our cellular machinery. These failures should not be thought of as inevitable breakdowns, but instead as reversible elements of aging.

One such reversible factor is a cellular enzyme called AMPK.

No matter which organ system or underlying disease is involved, if you trace the pathological process far enough back, you will likely encounter a problem related to insufficient AMPK activity.

This is good news for people who believe in significantly extending their life spans. That’s because a growing body of evidence suggests that boosting AMPK activity can prevent, and even reverse, life-shortening effects of aging. This includes disorders as disparate as cardiovascular disease, diabetes, liver and kidney failure, neurodegenerative diseases (e.g., Alzheimer’s), cancers, and more.

In fact, scientists are beginning to refer to AMPK as literally a suppressor of aging itself.

Substantial evidence indicates that restoring AMPK activity not only increases longevity, but works to fight the symptoms of aging in individual body systems.

In this article, we’ll take a closer look at AMPK, what it does, and how its activity level changes with advancing age and unhealthy lifestyles. We’ll then examine evidence showing that restoring AMPK activity can increase healthy longevity.
What Is AMPK?

AMPK stands for adenosine monophosphate-activated protein kinase. It is found in every living cell of every living mammal (and most other animals) on Earth. If you want to avoid the life span-shortening symptoms of aging, you need to maintain optimal AMPK activity.

AMPK has been referred to as a “metabolic master switch.” AMPK controls a gamut of metabolic pathways that enable us to extract energy from food, store and distribute that energy safely through the body, and ultimately use that energy for everything from moving and mating to talking and thinking, and even to understanding these very words as you read them.

The core role of AMPK is to sense each cell’s energy status at every moment, and to trigger responses that maintain the cell’s energy at precisely the optimum level. Too little available energy starves the cell, while too much energy can exhaust and disrupt cellular components. In either case (too little or too much energy), the cell (and the tissues, organs, and systems in which it is a part) functions inefficiently. That energy inefficiency ultimately leads to the dysfunctions we identify as the diseases (or symptoms) of aging.

Here’s how AMPK works: Every cell in your body depends absolutely on a steady supply of energy in the form of chemical bonds. When you eat and absorb nutrients, energy from chemical bonds in food is released and passed down a complex series of enzymes until it is stored again in a molecule called adenosine triphosphate, or ATP. The more ATP that is present in the cell, the higher the cell’s available energy supply. When ATP is broken down to release energy for cellular work, a major end product is adenosine monophosphate, or AMP.

If a cell were to use up all of its energy from ATP, it would rapidly fill up with low-energy AMP molecules. It would then run out of energy, and shortly thereafter, it would collapse and die, unable to sustain even the simplest energy-requiring processes.

And that is precisely where AMPK comes into play. AMPK is biochemically activated in the presence of rising levels of AMP (and decreasing levels of ATP). Activated AMPK, in turn, increases fatty acid oxidation and glucose transport, thereby releasing additional energy from available or stored sources (fats and sugars).

These processes, detailed in Table 1 at the bottom of this page, all work together to balance cellular metabolism. The net result is tight control over cellular energy levels so that they never fall low enough to impair cellular activity, but never rise high enough to damage cellular machinery.

### TABLE 1: Impact Of AMPK Activation In Selected Human Tissues

<table>
<thead>
<tr>
<th>Tissue</th>
<th>Energy-Releasing Processes</th>
<th>Energy-Storing Processes</th>
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<tr>
<td></td>
<td>Glucose Uptake</td>
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<td>Glucose Synthesis</td>
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<td>Skeletal Muscle</td>
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<td>Cardiac Muscle</td>
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<tr>
<td>Liver</td>
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<tr>
<td>Adipose (Fat) Tissue</td>
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AMPK also promotes the cellular “housekeeping” function called autophagy, in which cells consume themselves and recycle their contents, a process that eliminates damaged DNA and misshapen proteins that can themselves impair cellular function and even trigger cancers. As a result, young organisms with higher AMPK activity have a very low risk of cancer and degenerative disorders, such as Alzheimer’s disease, which stem from misfolded or damaged proteins. High levels of activated AMPK occur in youth, while low levels of activated AMPK occur in aging. We grow old, not simply because time passes, but because our youthful levels of AMPK drop away. And AMPK activity does decline sharply with age. That is why we become less energetic and get fatter as we grow older, while becoming increasingly vulnerable to cancer and diseases associated with impaired DNA and protein function.

The benefit of such tight control of energy levels is evident from studies of fruit flies genetically modified to synthesize high levels of AMP: They live up to one-third longer as a result of precise energy maintenance by activated AMPK. A long life span would be predictable from the data in Table 1, which shows that activated AMPK promotes energy-releasing processes while suppressing energy-storing processes. As a result, organisms with high AMPK activity are vigorous, active, and lean, with relatively low blood sugar and fat levels and little fat storage, and a very low risk of heart disease, diabetes, and other metabolic disorders.

Slow Aging With AMPK

- Although we seem to age by losing function in each organ or organ system separately, the truth is that aging largely results from universal processes that are common to all cells in the body.
- Management of energy from food to power cellular activity is one such process, and it is regulated by an enzyme called AMPK.
- Activated AMPK promotes all the processes we look for to maintain a youthful profile: rapid, efficient release of energy, with little energy storage as fat or new sugar molecules.
- Thus, activated AMPK keeps us lean and active, with a steady renewal of cellular components.
- AMPK activity fades with age. Just as importantly, when excessive calories are available, the result is accelerated tissue aging.
- You can boost AMPK activity through exercise and/or calorie restriction, but should also make use of natural supplements that support AMPK activity.
- Boosting AMPK activity will keep your tissues young and slow aging throughout your body.

AMPK also promotes the cellular “housekeeping” function called autophagy, in which cells consume themselves and recycle their contents, a process that eliminates damaged DNA and misshapen proteins that can themselves impair cellular function and even trigger cancers. As a result, young organisms with higher AMPK activity have a very low risk of cancer and degenerative disorders, such as Alzheimer’s disease, which stem from misfolded or damaged proteins. High levels of activated AMPK occur in youth, while low levels of activated AMPK occur in aging. We grow old, not simply because time passes, but because our youthful levels of AMPK drop away. And AMPK activity does decline sharply with age. That is why we become less energetic and get fatter as we grow older, while becoming increasingly vulnerable to cancer and diseases associated with impaired DNA and protein function.

But the modern American lifestyle, with its overabundance of nutrients and low level of physical activity, is even worse for the AMPK system than aging alone. It is now clear that, when caloric intake remains much higher than needed to sustain energy expenditure (think couch potato eating potato chips), AMPK activation is markedly decreased. This puts the body into a state exactly the opposite of that shown in Table 1. With reduced AMPK activity, cells decrease their energy-releasing ATP-generating activities, and instead shift to energy-storing processes that generate new fat deposits and make excess new glucose molecules.
Activated AMPK Promotes Longevity

The good news, as we’ll now see, is that we can restore our dwindling AMPK activity through a combination of lifestyle, diet, and supplement interventions, with the possibility of significantly increasing life span through mitigation of potentially fatal symptoms of aging.

The most compelling evidence that activating AMPK can help you live longer comes from a study just released in 2014, in which diabetic patients treated with the drug metformin, a potent AMPK activator, lived a median of 15% longer than did matched controls without diabetes.45

Inflammation is intimately involved in many disorders of aging, such as cardiovascular disease, diabetes, and cancer;42 conversely, inflammation further suppresses AMPK activation in a rapidly tightening lethal spiral. These processes can be seen schematically in Figure 1.41,43,44

FIGURE 1: Lifestyle And Genetic Factors Impair AMPK Activation

Coupled with genetic factors that remain unclear, lifestyle factors such as overnutrition and inactivity (blue) suppress AMPK activation, producing metabolic dysregulation, insulin resistance, and inflammation (red), that together produce the symptoms of aging that we identify as age-related diseases.

The modern picture of the overweight American, living a sedentary lifestyle and enjoying an overabundance of carbohydrates and calories, is harmful for AMPK activation and therefore deadly. We are literally eating ourselves to death. By suppressing AMPK activation, we develop dangerous fat deposits, especially in the belly region. Burgeoning fat masses reduce insulin sensitivity37-39 and produce systemwide inflammation,40 which may contribute to “metabolic syndrome.”41

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Take a moment to read that again: This study showed a longer median life span in diabetics than in healthy people—the only difference was their use of AMPK-activating metformin! By contrast, diabetics treated with drugs in the sulfonylurea category lived on average 38% shorter lives than did the metformin-treated group.45

Metformin is the most commonly used antidiabetic drug,46 but it has also been shown to have life-extending properties closely related to its activation of AMPK.47 Metformin-treated roundworms, for example, have higher AMPK activity and live about 20% longer than untreated control animals.48

Higher animals can also be made to live longer through metformin-induced AMPK activation. Mice supplemented with the drug demonstrated an increase in mean life span of nearly 6% compared with controls.47 As expected with AMPK activation, the supplemented mice also weighed less throughout their lives, which may have contributed to their increased longevity.

In fact, AMPK is so important in maintaining and restoring youthful function that it has been called a “gerosuppressor,” that is, a compound that significantly suppresses, not one or several diseases, but processes of biological aging.7 This is shown by the results of several lines of laboratory investigation.

AMPK activation triggers increased production of mitochondria, the energy-releasing “power plants” found in every cell.49-54 Since a reduction in mitochondrial numbers and function is associated with accelerated aging,55 AMPK-induced “mitochondrial biogenesis” can be expected to slow the aging process.

Activating AMPK in human cells in culture also stimulates production and activation of SIRT1,56 an enzyme that is increased in laboratory animals with extended life spans.57-59 SIRT1 can also be activated by marked calorie restriction, which has been demonstrated to increase life span in some species.60 Research now shows that AMPK activation can trigger the life-extending actions of SIRT1.41

Studies in primitive animals demonstrate that AMPK slows aging by modulating expression of critical transcription factors and enzymes, as would be expected by its effects on SIRT1.21,61,62 In fruit flies engineered to have higher AMP levels (which results in higher AMPK activity), for example, life span was extended by one-third compared with controls.20

One specific area of genetic modulation by AMPK is in control of systemwide inflammation; studies show that AMPK inhibits signaling by the master inflammation regulator called NF-kappaB.13 Reducing inflammation throughout the body is a key target in extending life span by preventing premature death from complications of aging such as cardiovascular and metabolic diseases. Let’s now look at some other aging manifestations, and see how AMPK can influence their outcomes.

**Activated AMPK Promotes Systemic Healthy Longevity**

AMPK activation has been shown to extend life span in several species.20,63,64 We’ve looked at some of the universal ways it does this, e.g., enhancing energy utilization, promoting new mitochondria, and reducing inflammation. Starting on the next page is a quick rundown on the roles of AMPK in specific body systems, where its activation can reduce the risk of age-related disorders.
AMPK AND AGING

**Immune Function**

Infections are a leading cause of death among older adults and AMPK activation is critical in the immune system, where it has been shown to:

- Enhance white blood cells’ ability to home in on and kill invading bacteria.65
- Prevent infection with Rift Valley Fever Virus (a potentially lethal virus originating in Africa) by blocking fatty acid synthesis the virus needs to replicate itself.66

**Cancer**

Cancer remains the second leading cause of death in the US.67 Its growth and invasiveness are closely related to the loss of regulation of AMPK signaling.68 AMPK activation is critical in:

- Inhibiting tumor cell growth and promoting tumor cell destruction by programmed cell death (apoptosis).69-72
- Increasing cancer cell vulnerability to chemotherapy.73,74
- Switching cancer cells’ metabolism from the unique ability to burn sugar in the absence of glucose toward a more normal oxygen-requiring pathway, thereby inhibiting tumor growth.75,76

**Cardiovascular Disease And Atherosclerosis**

Heart and blood vessel diseases are the leading causes of death in Americans.77 They are intimately related to AMPK’s functions as an energy regulator, particularly when it comes to fatty acids and cholesterol.78 Activation of AMPK has been shown to:

- Inhibit damage to blood vessel lining (endothelial) cells caused by oxidized LDL (“bad”) cholesterol.79
- Reduce vascular cell death in response to low oxygen levels (which occur during a heart attack or stroke).80
- Reduce the ability of vascular smooth muscle cells to migrate and draw in inflammatory cells to form artery-clogging plaques.81
- Suppress activity of enzymes known to produce large volumes of dangerous reactive oxygen species that damage arterial linings.82

**Metabolic Syndrome And Diabetes**

Diabetes alone is the seventh leading cause of death in America and like metabolic syndrome, energy balance is dysregulated.87 As a metabolic regulator, AMPK has been shown to:

- Regulate oxidative metabolism to reduce inflammation caused by immune system cells in cardiac tissue.83-85
- Reverse the hypertension-inducing effects of angiotensin II, a peptide hormone involved in salt and fluid balance.86

- Reduce insulin resistance and support glucose transport out of the bloodstream, allowing body cells to utilize available insulin and lower blood sugar.88,89
- Reduce weight gain in diet-induced obesity in animals.90
- Inhibit metabolic syndrome-associated inflammation.13
- Improve mitochondrial fat-burning94 function and enhance the effect of the anti-obesity hormone adiponectin.95

- Reduce output of glucose from the liver, a major contributor to sustained high blood sugar levels.92,93
- Reduce vascular smooth muscle cells to migrate and draw in inflammatory cells to form artery-clogging plaques.81
- Suppress activity of enzymes known to produce large volumes of dangerous reactive oxygen species that damage arterial linings.82
Or, you can take the opposite approach, metabolically, by engaging in marked calorie restriction of 30%, which is not the same as the moderate dieting we all try. In this case, low levels of available energy lead to rising AMP levels, and again activation of AMPK.

As anyone who has tried dieting knows, it simply doesn’t work that way. You can cut calories painfully, but lose very little weight unless you add a program of moderate exercise. Now that we understand how AMPK works, we can see why.

An American who has been enjoying a surfeit of calories for a long time has suppressed the AMPK system sharply. That leaves the person’s body in a state of continued energy storage and reduced energy utilization. Cutting calories forces the body to activate AMPK to make more of its own glucose and fat, and to sustain fat stores inappropriately.

Exercise, we now know, is a powerful AMPK-activating strategy. So it is only when adding exercise, or some other AMPK-activating factor, that regular dieting becomes effective. Activated AMPK puts the whole body back on its youthful track, effectively burning off energy, while draining fat stores instead of refilling them.

Sustained exercise programs, of course, are hard for most people to manage. Drug companies are rushing to manufacture synthetic molecules to activate AMPK, but these are years in the future and likely to be fraught with high costs and safety issues. Fortunately, a growing number of naturally occurring molecules show potent and safe AMPK-activating properties, and are available now at a low cost.

**Liver Disease**

Fat accumulation in the liver is a major consequence of the metabolic syndrome, and can lead to liver inflammation and scarring that shortens life span. AMPK activation in liver tissue:

- Reduces the expression of lipogenic genes while increasing the expression of lipolytic genes.
- Inhibits liver fibrosis, the scarring that leads to life-threatening cirrhosis.
- Increases the number of mitochondria, thereby enhancing fatty acid oxidation.

**Promoting AMPK Activation Naturally**

It is evident that you should do all you can to maintain and even boost your AMPK activity if you want to slow aging throughout your body. You can use drugs, but obtaining prescriptions for drugs like metformin is challenging unless you happen to be a type II diabetic.

More natural ways to boost AMPK involve lifestyle changes. Regular moderate exercise is a good approach, since we know that muscle contractions are potent triggers for AMPK activation. And of course, an exercising body uses up ATP, generating higher AMP levels, activating AMPK. As we age past 60, however, the ability of vigorous exercise to increase AMPK diminishes.

Or, you can take the opposite approach, metabolically, by engaging in marked calorie restriction of 30%, which is not the same as the moderate dieting we all try. In this case, low levels of available energy lead to rising AMP levels, and again activation of AMPK. AMPK activation is credited with the remarkable life extension seen in several species, with promising physiological effects in humans.

But, regardless of which of these strategies you try, or even if you haven’t the discipline to do any of them, there is still plenty you can do to boost your AMPK activity by using certain supplements. Indeed, many supplements originally recognized for their nutritional properties are now being found to increase AMPK activation, which may contribute to their life-extending effects.
Here are two of the better-documented AMPK-activating ingredients and their beneficial impact on processes that accelerate aging:

1. *Gynostemma pentaphyllum*, a traditional Vietnamese herb, activates AMPK to dramatically reshape the way human bodies handle excess glucose and fat.\textsuperscript{103-106} A study of human type II diabetics, taking no medications, showed that daily supplementation with *G. pentaphyllum* tea for 12 weeks:\textsuperscript{103}

- Reduced fasting blood sugar levels by a significant 54.1 mg/dL, compared with just 10.8 mg/dL in the control group.
- Lowered hemoglobin A1c levels, a measure of chronic glucose elevation, by a 2% unit reduction, which accounts for a 10-fold improvement over controls.
- Significantly reduced insulin resistance in the supplemented group, while insulin resistance rose in the control subjects.

A similar study in type II diabetics already on therapy with a common antidiabetic drug, gliclazide, showed that *G. pentaphyllum* extract could add significantly to the drug’s effects.\textsuperscript{105}

- A further reduction in fasting blood sugar of 52.2 mg/dL in subjects who added the supplement, compared with just 16.2 mg/dL in patients on the drug alone.
- A 2% unit reduction in hemoglobin A1c in supplemented patients, compared with only 0.7-unit reduction in controls.

A study of obese people with elevated waist-to-hip ratio showed that daily supplementation with *G. pentaphyllum* extract for 12 weeks:106

- Significantly reduced body weight, total abdominal fat area, body fat mass, percentage of body fat, and body mass index, compared to a placebo group of similarly obese patients.

2. *Trans-tiliroside*, a bioactive obtained from rose hips, adds additional AMPK activation to sharply curtail fat accumulation and speed fat burning. In cultured human fat cells (adipocytes), rose hip extract and *trans-tiliroside* both prevented new fat accumulation.\textsuperscript{107}

When mice were made obese through a high-fat diet, and then either supplemented with rose hip extract or no supplement, the supplemented animals:

- Gained less body weight and developed less abdominal fat than the control animals.
- Had lower liver weight, indicating less liver fat, than controls.

In a study of obese humans, a daily drink made from rose hip powder, used for six weeks, resulted in:108

- Reduction of systolic blood pressure by 3.4%.
- Reductions in total and LDL (“bad”) cholesterol of 4.9 and 6%, respectively, and of 6.5% in the ratio of LDL to HDL (“good”) cholesterol.
- A 17% reduction in a standardized cardiovascular disease risk score.

It seems certain that many other natural products will emerge as AMPK activators, given the widespread distribution of AMPK throughout the world.
**Summary**

To really understand aging, we have to recognize that it is not an automatic result of time passing, but rather the result of reversible events that occur in all cells, regardless of the tissue or organ system to which they belong.

One of the most fundamental of those events is a decline in activity of AMPK, the universal cellular energy sensor that dictates whether cells store energy as dangerous fats or use energy efficiently to power vital processes. Activated AMPK creates a more youthful energy profile, one with only small amounts of fat stores, a great deal of energy for useful activity, and rapid recycling of old, damaged proteins.

Studies are increasingly revealing the central role of AMPK in maintaining youthful function across the entire spectrum of cell and tissue types, resulting in increased longevity. This “systemic anti-aging” approach is likely to be much more successful than mainstream medicine’s “one disease at a time” strategy, which treats each disease as a separate entity and accounts for America’s destructive addiction to prescription drugs.

It’s critical that you understand AMPK and how to optimize its activation in your body if you want to extend your life span in the best possible state of health.

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

**References**


19. If you have any questions on the scientific content of this article, please call a Life Extension® Health Advisor at 1-866-864-3027.
AMPK AND AGING


Ceramides are essential for preserving healthy-looking skin.\textsuperscript{1,2} They play an important role in maintaining the skin’s moisture balance and protecting the skin’s surface.\textsuperscript{3}

Unfortunately, your body’s production of ceramides declines with age.\textsuperscript{4} Many anti-aging face creams include ceramides. The problem is that topical application cannot penetrate deeply enough to have a long-term impact on your skin’s appearance.

**Restoring Youthful Ceramide Levels**

Researchers have discovered that the ceramides naturally produced by young skin are identical to those present in wheat—and that these wheat-derived oils can be taken orally.

**Skin Restoring Phytoceramides with Lipowheat\textsuperscript{®}** can reach the deepest layers of skin all over the body—not just where creams are applied—where it can offset the visible impact of the body’s gradual decline in ceramides. The hydrating action of Lipowheat\textsuperscript{®} ceramides has proved effective in clinical trials.

**Just One Capsule Daily**

Life Extension\textsuperscript{®} has brought together these skin-nourishing oils in a concentrated oral formula called **Skin Restoring Phytoceramides with Lipowheat\textsuperscript{®}**.

**References**


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A PARADIGM IN CONTROLLING AGING

Found in every cell,12 AMPK promotes longevity factors that have been shown to extend lifespan in numerous organisms.3,4 Increasing AMPK signaling “turns off” many damaging effects of aging, thus enabling cells to return to their youthful vitality.5

Importance Of AMPK

Studies show increased AMPK activity supports reduced fat storage,6 new mitochondria production,7 and the promotion of healthy blood glucose and lipids already within normal range.4

Gynostemma Pentaphyllum

An extract of the plant Gynostemma pentaphyllum promotes AMPK activation.6-10 In one of many studies showing a wide variety of benefits, researchers documented a 1-inch reduction in abdominal circumference in overweight individuals who took 450 mg daily of G. pentaphyllum extract for 12 weeks.11

Trans-Tiliroside

Trans-tiliroside, extracted from plants such as rose hips, boosts AMPK activation, but triggers different downstream metabolic benefits than G. pentaphyllum.12,13 Among its many benefits, a low equivalent dose of 56 mg daily trans-tiliroside has been shown by researchers in preclinical studies to promote healthy blood glucose levels and body weight already within normal range.15

Activate Your AMPK!

Over 7,500 published studies document the role that AMPK plays in protecting critical cellular functions. Those seeking healthy aging should prioritize re-activating their AMPK cellular enzyme.

AMPK Activator provides nutrients shown to significantly boost AMPK activity. The suggested daily dosage of AMPK Activator is to take two capsules with the first meal of the day and one capsule with the second meal. Three capsules provide:

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To order AMPK Activator, call 1-800-544-4440 or visit www.LifeExtension.com

These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease.
Compelling evidence is accumulating that the trace mineral boron plays an important role in protecting men against deadly prostate cancer.¹⁻³

As men grow older, their risk for prostate cancer skyrockets and metastasis outside the prostate is “uniformly lethal.”¹

Fortunately, eye-opening studies demonstrate that boron has been found to selectively kill prostate cancer cells while leaving healthy cells unharmed.²⁻⁴ In addition, boron has been found to lower PSA¹—which was previously believed to be only a marker for prostate cancer. More recent research shows that elevated PSA is a causative factor in prostate cancer progression.¹

Adequate boron levels are associated with a 64% reduced risk of prostate cancer,³ but obtaining protective levels of boron from food alone is difficult.⁵ This means that supplementation with low-cost boron could be a lifesaver for aging males at risk for prostate cancer, in addition to other health benefits provided by this vital mineral.
BORON REDUCES PROSTATE CANCER RISK

These findings not only underscored the remarkable, broad-spectrum health benefits associated with consuming fruits, but also suggested that boron in particular may be responsible for some of these protective benefits.

Encouraged by these epidemiological findings showing a connection between dietary intake of boron and reduced risk for prostate cancer, scientists set out to determine if supplementing with boron could protect against prostate cancer. Initial animal studies indicated that the answer is yes.

In a validated animal model of prostate cancer, researchers found that oral administration of various concentrations of a boron-containing solution substantially decreased tumor size. It also lowered levels of prostate-specific antigen or PSA—the most abundant protein synthesized in the prostate gland—suggesting a possible mechanism for these anticancer effects.7

In this animal model, researchers orally administered various concentrations of a boron-containing solution to test subjects and found that this resulted in decreases in prostate tumor size by **25%** to **38%**. Remarkably, PSA levels dropped by an astounding **86%** to **89%** in the animals that received boron.7

These findings suggested that supplemental boron may have both preventive and therapeutic effects—helping both to shrink prostate tumors and to decrease levels of PSA.

**Preferentially Targets Prostate Cancer Cells**

The idea that supplemental use of boron might reduce the risk of prostate cancer was first brought to the attention of scientists following a 2001 study on dietary patterns of prostate cancer patients as reported long ago in *Life Extension* magazine.

This study compared the diets of 76 prostate cancer patients with those of 7,651 men without cancer. Researchers found that men who ingested the greatest amount of boron from their diets were **64%** less likely to develop prostate cancer than those who consumed the least.

Interestingly, while there was a significant decrease in cancer risk in the group that consumed the most boron, those in the highest intake group only consumed 2.5 additional servings of fruit and one additional serving of nuts per day compared to those in the lowest boron intake group.3

A subsequent study confirmed these findings. For the study, the researchers compared the dietary boron intake of 95 prostate cancer patients with that of 8,720 healthy male controls. Researchers controlled for age, race, education, smoking, body mass index, dietary caloric intake, and alcohol consumption. They found that men with the highest boron intake showed a **54%** lower risk of prostate cancer compared to those with the lowest intake.6 In addition, they noted that increased dietary boron intake was associated with a decreased risk of prostate cancer in a dose-response manner.

**Novel Protective Mechanisms**

The finding that supplemental boron can help to shrink prostate tumors while also decreasing levels of PSA7 is particularly exciting. At one time, PSA was viewed primarily as a blood indicator of prostate cancer, infection, or inflammation. However, evidence now reveals that PSA plays a critical role in the progression and metastasis of prostate cancer, thus opening up new therapeutic pathways for preventing and treating this epidemic disease with PSA-lowering nutrients such as boron.5,8-11

Scientists now believe that elevated PSA breaks down the protein surrounding the cells (called the extra-cellular protein matrix) within the prostate gland. The breakdown of these cellular barriers by excess PSA may be what enables prostate cancer cells to more readily invade healthy tissue and spread themselves beyond the prostate gland, with potentially lethal consequences.6 This remarkable data provides further understanding as to how we may prevent or slow down prostate cancer by reducing PSA levels.
BORON REDuces PROSTATE CANCER RISK

What You Need To Know

Published evidence further suggests that higher intake of boron-containing compounds can inhibit PSA activity\(^7\) and lower the risk of prostate cancer by reducing intracellular calcium signals and storage.\(^12\)

Using Boron As Adjuvant Treatment

A number of studies have led researchers to conclude that boron could have specific therapeutic potential in the treatment of prostate cancer. Less well-known than PSA is a protein called **prostate specific membrane antigen** or **PSMA**. While PSMA has not yet been completely verified as a marker for prostate cancer, studies have shown that the expression of PSMA in tumors and metastases of men with prostate cancer is greater than PSMA in men without prostate cancer.\(^13\)

In 2014, scientists published a cell study based on the ability of boron to inhibit **PSMA**. They found that boron-rich compounds demonstrated significant uptake by prostate cancer cells, which indicated that boron compounds may be useful in developing a new class of therapeutic agents—among those known as **boron neutron capture therapy** or **BCNT**—against prostate cancer. BCNT is a type of noninvasive, injection-based anticancer therapy using boron.\(^14\)

Another aspect of boron that makes it an especially beneficial therapeutic agent is its ability to selectively inhibit the growth of prostate cancer cells while still allowing normal prostate cells to grow. Scientists know that these actions are dose-dependent, though the underlying mechanism for this targeted effect is still under investigation.\(^4\)

A 2014 study published in *Tumour Biology*, however, did reveal that a compound containing boron induced apoptosis, or cell death, in prostate cancer cells. The researchers were able to determine that the boron agent disrupted the normal organization of prostate cancer cells’ **actin filaments**, which are threadlike, protein fibers that are an essential element or building block of the cell. The compound containing boron exerted other cytotoxic or cell-killing effects, including the reduction of telomerase activity in the cancer cells. They concluded that the boron in this compound “**could be an important agent for its therapeutic potential in the treatment of prostate cancer**.”\(^2\)

The increasingly evident conclusion is that ensuring an adequate daily boron intake via supplementation—and not relying on the small and extremely variable amounts of boron available in plant foods from different agricultural regions—represents an important component of a strategy to prevent prostate cancer and maintain optimal PSA levels.

In fact, emerging studies now suggest that boron delivers another layer of protection against the symptoms of this prostate cancer—in the bone.

Reduce Cancer Risk With Boron

- Boron is increasingly recognized for its targeted capacity to destroy prostate cancer cells and lower prostate-specific antigen, or PSA—while leaving healthy cells unharmed.
- Sufficient amounts of boron also support healthy bones and joints, as well as reducing the risk and pain of osteoarthritis.
- Boron quantities found in food are usually very low.
- Adequate boron intake via supplements may help prevent or control potentially lethal prostate cancer and support optimum health.

• Boron is increasingly recognized for its targeted capacity to destroy prostate cancer cells and lower prostate-specific antigen, or PSA—while leaving healthy cells unharmed.

Published evidence further suggests that higher intake of boron-containing compounds can inhibit PSA activity\(^7\) and lower the risk of prostate cancer by reducing intracellular calcium signals and storage.\(^12\)
Critical Player
In Bone Health

The major and most deadly danger in prostate cancer is its ability to spread to the bone, which is its natural evolution. Bone is the initial and main site for about 80% of all prostate cancer metastases.15 They occur most commonly in the spine, pelvis, ribs, skull, and proximal femur.16

These bone metastases induce significant skeletal remodeling, fractures, anemia, and pain—and are a major cause of morbidity and mortality.17 Prostate cancer has been described as “uniformly lethal once it has escaped the confines of the prostate gland.”1 Sadly, the median survival of patients after prostate cancer has spread to the bone is 40 months.16

Although more studies are needed, boron’s remarkably targeted capacity to inhibit the spread of prostate cancer cells while sparing normal cells4 may have the same targeted effect against prostate cancer cells that have migrated to the bone. With wider boron supplementation, this cytotoxic effect—combined with boron’s potential to help prevent prostate cancer from occurring in the first place—could reduce the current 28,000 American deaths from this disease every year.1

Weak bones—whether the result of cancer or aging—can lead to pain, fracture, and disability. Few people realize that boron plays an integral part in bone metabolism. Boron supports the functions of calcium, magnesium, and vitamin D, all of which are crucial to promoting dense, healthy bone tissue.5,18-20

In an important study of postmenopausal women who were not on estrogen replacement therapy, scientists found that a boron-supplemented diet increased levels of two hormones associated with healthy bone mass. Boron also reduced depletion of the body’s stores of bone-building calcium and magnesium—importantly, this benefit occurred during periods of both adequate magnesium intake and magnesium deficiency.19

Another study showed that when animals were fed a diet deficient in vitamin D, increasing their dietary intake of boron helped support optimal calcium absorption—demonstrating that boron promotes optimal mineral balance and ensures healthy calcium utilization.20

A 2013 scientific review found that calcium fructoborate—a natural boron complex—significantly reduces human serum levels of C-reactive protein (CRP). This protein is a marker for inflammation, and has been identified as a possible contributor to the disruption of the normal bone remodeling process. Remodeling is essential to healthy bone mineral density, and the study author concluded that this boron complex “may contribute to bone health by controlling the inflammation associated with loss of bone mineral density.”21

Prostate Cancer: What’s Your Risk?

Also known as carcinoma of the prostate—a gland in the male reproductive system—prostate cancer:

• Is diagnosed in about 209,000 American men every year31
• Is the most common cancer among men82,33
• Is the second leading cause of cancer death among men (after lung cancer)32
• Kills about 28,000 American men annually31
• Can occur without exhibiting any symptoms at all34
• Can result in any of the following symptoms:34
  - Difficulty starting urination
  - Weak or interrupted flow of urine
  - Frequent urination, especially at night
  - Difficulty emptying the bladder completely
  - Pain or burning during urination
  - Blood in the urine or semen
  - Pain in the back, hips, or pelvis that doesn’t go away
  - Painful ejaculation
• May be up to 64% less likely to strike men with adequate boron levels than men with boron deficiency3
BORON REDUCES PROSTATE CANCER RISK

Helps Reduce Inflammatory Conditions

Beyond its promising reduction of prostate cancer risks, boron’s anti-inflammatory mechanisms have other benefits throughout the body. About 52 million Americans suffer from some form of arthritis. Fortunately, boron inhibits pro-inflammatory factors that contribute to the development of arthritis.

A review of previous studies found that boron exerts favorable immunomodulatory effects on the inflammatory process, decreasing joint swelling and improving restricted movement. Boron was also found to inhibit lipooxygenase (LOX)—an enzyme that triggers the inflammatory cascade to increase inflammatory leukotrienes.

In a double-blind study in people with severe osteoarthritis, scientists found that in those who completed the trial, 71% of those taking boron improved, while only 10% of those taking placebo improved. No side effects were observed.

We mentioned earlier that boron is essential to promoting strong, healthy bones. This makes boron especially important for those suffering from osteoarthritis. This was clearly demonstrated in a study in which scientists compared control bone samples to samples taken from fracture patients and osteoarthritis patients. While fracture bone samples did not differ from control samples, bone samples taken from areas adjacent to osteoarthritic joints showed reduced mineral content—including a lower level of boron. This suggests that there is a more rapid turnover of bone in afflicted joints and that boron—used as a bone-building material—is quickly depleted.

One study even found that boron can reduce the pain associated with osteoarthritis. For the study, 50% of osteoarthritis patients who received 6 mg of boron daily reported less pain from movement, while only 10% given a placebo experienced similar improvement. This was likely due to decreased production of pain-provoking inflammatory mediators.

Adding further proof to boron’s beneficial impact on arthritis, researchers have found a connection between dietary intake and incidence of arthritis. In areas of the world where daily boron intake is 1 mg or less, the incidence of arthritis ranges from 20% to as high as 70%. Conversely, in world regions where daily boron intake is 3 to 10 mg, the incidence of arthritis is much lower, ranging from 0 to 10%.

These findings indicate that adequate boron intake confers powerful protection against osteoarthritis.

Summary

In addition to its potent support for healthy bones and joints, boron is emerging as a highly targeted inhibitor of prostate cancer cells and their metastases. It can kill these cancerous cells without harming healthy prostate cells.

Boron: Not Abundantly Found In Food

Boron is a trace mineral that is essential to plant growth and finds its way into the human diet through our consumption of plant foods—especially apples, plums, grapes, avocados, vegetables, nuts, and legumes.

Despite its widespread availability in plant foods, ingesting adequate amounts of boron through dietary choices can be difficult. Why? Because the total quantity of boron in any one plant food is very low.

For example, apples are considered to be a good source of boron. However, to attain the minimum 3 mg daily intake of boron that is generally suggested, you would need to eat about 2.4 pounds of apples a day—that’s over eight apples! You wouldn’t have to worry about surpassing the tolerable daily intake (TDI) for boron until you managed to consume about 68 apples during a single day.

Worse, with modern dietary habits, many individuals can develop a boron deficiency by simply failing to eat enough fruits, vegetables, and nuts. And even among those whose diets include rich quantities of these plant foods, their boron intake will be greatly affected by regional geology because the food content of boron varies greatly according to the boron content of the soil in the region where the produce was grown. Even local preferences for some foods over others can result in high or low human boron levels.

Ensuring optimal boron intake becomes increasingly important as we age. While boron has long been recognized for its critical role in safeguarding bone health, scientists are increasingly excited about growing evidence of boron’s powerful role in blocking the development of prostate cancer.

This idea has sparked intense interest among researchers, because this potentially fatal disease is at epidemic proportions. Autopsy evidence indicates that prostate cancer is histologically evident in up to 34% of men aged 40 to 49 and up to 70% of men aged 80 and older.
Scientists have demonstrated that boron lowers prostate-specific antigen, or PSA—and may help prevent or control the spread of prostate cancer. Other evidence links boron to reduced cognitive decline.

Boron levels in foods are low, but supplementing with this trace mineral may be the little-known missing link for those seeking a mechanism of defense against prostate cancer, bone loss—as well as overall support for optimum health.

For many years, most Life Extension supporters have been getting 3 to 6 mg of boron in their multinutrients supplements. For most individuals, this may be an optimal amount. Certain individuals may want to increase this dose to 9 to 12 mg daily. Fortunately, boron is a very low-cost supplement.

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

References


Bone Restore combines numerous bone-boosting nutrients into one superior, easy-to-take formula.

Bone density loss is more than just a calcium deficiency—it also includes an insufficient intake of a host of other nutrients. In addition to 700 mg of calcium, Bone Restore includes highly absorbable forms of:

- Vitamin D3
- Magnesium
- Manganese
- Boron
- Zinc
- Silicon

These nutrients help aging adults achieve optimal calcium levels.

Bone Restore also contains vitamin K2, which has been shown to play a critical role in maintaining healthy bone density by facilitating the transport of calcium from the bloodstream into the bone.

Those taking Once-Daily Health Booster or Super K usually do not need additional vitamin K2. For these individuals, Bone Restore is available without vitamin K2. The retail price for this formula of 120 capsules is $22. If four bottles are purchased, the price is reduced to $14.25 per bottle. (Item# 01726)

Note: Those taking the anticoagulant drug Coumadin® (warfarin) should use BONE RESTORE without vitamin K2.

Fruitex® and OsteoBoron® are registered trademarks of VDF Futureceuticals, Inc. U.S. patent #5,962,049. DimaCal® and TRAACS® are registered trademarks of Albion Laboratories, Inc. Malate is covered by U.S. Patent 6,706,904 and patents pending.
Mitochondrial Energy Optimizer

MAJOR PRICE REDUCTION

Back in year 2001, we at Life Extension™ faced a dilemma. Potent nutrients had been discovered to counteract undesirable age-related changes. Yet the cost of the individual ingredients was too high. So we combined these nutrients into one formula so consumers could obtain them at an affordable price.

Over the years, the published data about the amino acid taurine has grown enormously. In addition to protecting cardiac function, taurine has demonstrated powerful brain-boosting effects that include enhancing neurites and promoting new brain cell formation.

These new findings indicate that taurine is more important to supplement with than acetyl-l-carnitine arginate. In addition, taurine costs much less than acetyl-l-carnitine arginate.

So we’ve re-formulated the popular Mitochondrial Energy Optimizer using taurine and reduced the retail price over 20%.

Aging is characterized by inflammation, glycation, mitochondrial decay, and loss of cellular structure/function. Mitochondrial Energy Optimizer provides the following nutrients to help neutralize these changes:

- **CARNOSINE**: As humans age, proteins in their bodies become irreversibly damaged by glycation reactions. Glycation can lead to alterations of normal cell function. Carnosine is a powerful anti-glycating agent, and protects neurons against reactive and cytotoxic protein carbonyl species associated with normal aging.1-7

- **R-LIPOIC ACID**: A flavonoid that has been shown to help suppress these inflammatory cytokines.13-17

- **PYRIDOXAL 5’-PHOSPHATE**: Aging results in the formation of advanced glycation end products throughout the body. Pyridoxal 5’-phosphate is the active form of vitamin B6 that has been shown to protect against both lipid and protein glycation reactions.25-28

- **R-LIPOIC ACID**: Destructive free radical activity in the mitochondria plays a major role in the loss of cellular vitality. A microencapsulated Bio-Enhanced R-lipoic acid facilitates youthful mitochondrial energy output while guarding against free radicals.29-33

Just four capsules of Mitochondrial Energy Optimizer with BioPQQ® provide:

- **Carnosine**: 1,000 mg
- **Taurine**: 800 mg
- **R-Lipoic acid (as microencapsulated Bio-Enhanced)**: 150 mg
- **Benfotiamine**: 150 mg
- **Vitamin B6 (as pyridoxal 5'-phosphate)**: 100 mg
- **BioPQQ®** Pyrroloquinoline quinone disodium salt: 10 mg
- **Luteolin**: 8 mg

Note: Those interested in continuing to take acetyl-l-carnitine arginate can do so by ordering item #01525.

Bio-Enhanced® is a registered trademark of Geronova Research, Inc. BioPQQ® is a registered trademark of MGC (Japan).

To order Mitochondrial Energy Optimizer with BioPQQ®, call 1-800-544-4440 or visit www.LifeExtension.com

These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease.
Boron is a critical nutrient—but it is not abundant in most diets. Food levels of this trace mineral are low and frequently variable.

Prostate Function
Recent scientific research has shown that boron promotes healthy prostate function. Evidence also suggests that it helps to reduce intracellular calcium signals and storage.

Bone, Joint, And Brain Support
Boron supports the functions of calcium, magnesium, and vitamin D—all of which are crucial to promoting dense, healthy bone tissue. By regulating pro-inflammatory factors, boron may support joint health. Additional evidence suggests boron may help maintain normal brain function.

Bioavailable Formulation
Life Extension® Boron contains a unique synergistic combination of three highly utilizable, 100% natural chelated sources of the trace mineral boron—boron citrate, boron aspartate, and boron glycinate.

You May Already Be Obtaining Enough Boron
Life Extension has long recognized the health benefits of obtaining sufficient daily boron. That’s why there are 3 milligrams of boron in the daily dose of each of the following formulas:
- Two-Per-Day
- Ultra-Natural Prostate
- Bone Restore
- Life Extension Mix

The suggested daily dose for most adults is 6-9 mg of boron. If you are already obtaining this potency in your multi-nutrient formulas, you may not need additional boron. Certain individuals may want to supplement with up to 12 mg of boron each day.

References:

To order Life Extension® Boron, call 1-800-544-4440 or visit www.LifeExtension.com

These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease.
Back in the late 1950s, a German scientist named Klaus Schwarz, working in the United States at the National Institutes of Health, was alarmed to discover that his laboratory rats were mysteriously developing liver disease.

Schwarz was again surprised to find that when he switched the source of protein in the rats’ diet from torula yeast to baker’s yeast, they no longer developed liver disease. After carefully studying this curiosity, Schwarz found that the torula yeast was deficient in a particular trace mineral, while baker’s yeast was not.

The trace element turned out to be selenium.1

This pioneering discovery led to the classification of selenium as nutritionally essential.2

Since then, an enormous amount of scientific inquiry has revealed that selenium plays critical roles in numerous aspects of human health.

Via its incorporation into more than two dozen selenoproteins throughout the body,3,4 selenium provides potent defense against cancer-causing DNA damage,4,5 facilitates removal of dangerous toxins from the body,6 supports optimal thyroid function,7 maintains immune system activity,3,8,9 and much more.

Indeed, studies suggest that inadequate selenium increases risk of cardiovascular disease,3,10 some cancers,3,11-13 cognitive dysfunction,14 and even death.15-18

And while evidence indicates that selenium levels decline with advancing age,19,20 it is perhaps not surprising that when researchers studied a population of very long-lived people, they found the highest selenium levels in individuals over 100 years old.21
Selenium Protects Against Some Cancers

One way that selenium may boost longevity is by protecting against various forms of cancer. As early as 1996, selenium supplementation was shown to lower overall cancer rates, and to specifically reduce rates of lung, colorectal, and prostate cancers.25-27

By 2011, nine randomized controlled clinical trials including 152,538 participants established that selenium supplementation cut risk for all cancers by 24%. And in people with low baseline levels of selenium, the cancer-preventive effect rose significantly to 36%.28

Studies also show that adequate dietary selenium exerts powerful preventive effects on prostate and colorectal cancer, two of the most common malignancies.29-31

In addition, many studies have demonstrated that a deficiency in selenium increases cancer risk. Large-scale epidemiologic studies have shown that populations with low selenium levels are at significantly increased risk for developing many different types of cancer.26,32-35 Specifically, selenium insufficiencies are now known to significantly increase risk of cancers of the bladder, lung, stomach, esophagus, and liver.36-40

Not all forms of selenium are the same. It is important to utilize three specific forms in order to maximize selenium's cancer-fighting potential. The three forms include sodium selenite, L-selenomethionine, and selenium-methyl L-selenocysteine. All three selenium compounds induce cell death in various cancer types, though each compound is better at destroying some cancers than others.41,42

For example, sodium selenite boosts the body’s natural immune system responsiveness to abnormal cells, helping to destroy malignancies before they can fully develop.9,43,44

The second form, L-Selenomethionine, helps stop cancer at the earliest stages of development. It's so powerful that it has been shown to inhibit the growth of cancer cells at rates more than a thousand times greater than it does healthy normal tissue.45 L-selenomethionine requires a functioning “suicide gene” in cells in order for it to induce the desired cell death by apoptosis.41 This is an important first step that can stop cancer cells very early in the development of a malignancy. Unfortunately, as cancer cells reproduce, they gradually lose the “suicide gene,” thereby requiring backup therapy to fully close the door on cancer.

That’s why it’s beneficial to partner L-selenomethionine with the third form, selenium-methyl L-selenocysteine, which is one of the most potent forms of selenium known.46 Selenium-methyl L-selenocysteine induces apoptosis in cancer cells further down the cascade of events in a fashion that kills more mature cancer cells that have lost the “suicide gene.”41

What The “Oldest Old” Have In Common

Selenium functions as a critical regulator of vital metabolic and physiological pathways involved in the aging process.3,22

One of the best examples of selenium’s importance in longevity came from a study of people who live in areas of China known to have the “oldest old” population. For the study, researchers evaluated the plasma selenium levels of 446 elderly participants living in these areas of notable longevity in China. The study included 208 centenarians (those over 100 years old) and 238 people between 90 and 100 years old. The researchers found that the oldest inhabitants had the highest levels of selenium and other minerals like zinc.21

Animal studies confirm that selenium can extend survival—even for those with typically life-threatening diseases. For example, laboratory mice with induced mammary cancers (like human breast cancers) die earlier than do their cancer-free peers. Supplementing the animals with selenium markedly extended their survival.23

Plasma selenium levels appear to predict mortality in humans as well. In a nine-year study of older adults living in France, those with the highest plasma selenium levels at the beginning of the study were more likely to remain alive at the end.24 The risk of dying during the study period was 54% higher in subjects with the lowest baseline selenium levels. The risk of dying specifically from cancer in this study was 79% higher in those with the lowest selenium levels.24
Intervention studies examining the anti-cancer effects of selenium have produced variable results. Important differences between the studies that may have influenced the results, include initial selenium status and the form of selenium that was provided.\textsuperscript{47} An assessment of status is a key factor for all nutritional intervention studies. With respect to selenium, the form ingested may influence outcomes, since it dictates the metabolic fate and ultimately the biological function; however additional clinical research would be required to prove such a connection.\textsuperscript{48-50}

**Human Studies**

A number of human studies have examined the role of three different forms of selenium and cancer risk. We describe a few of them here.

In a randomized controlled clinical trial, patients with aggressive head and neck cancers took either 200 micrograms per day of sodium selenite or a placebo. The supplemented patients showed an increased ability to destroy tumor cells, which is the result of enhanced immune responses.\textsuperscript{43} Remarkably, the enhanced immunity continued even after therapy ended.

In patients with mild precancerous changes of their esophagus, 200 micrograms of L-selenomethionine slowed the progression of potentially cancerous cells and triggered regression of precancerous cells to normal.\textsuperscript{51}

In terms of prevention, sodium selenite supplementation for three years reduced the occurrence of new cases of liver cancer by 40\%.\textsuperscript{52} And a reduction in new breast cancer cases was demonstrated in a group of women with the high-risk BRCA1 gene mutation, during a double-blind supplementation trial.\textsuperscript{53}

In a now-famous 1996 study, 200 micrograms per day of L-selenomethionine was found to significantly protect patients from death by all cancers (a 50\% reduction compared with controls), from developing any cancer (a 37\% reduction), and specifically from developing lung, colorectal, and prostate cancers.\textsuperscript{25}

Since then, L-selenomethionine has been found to produce a 63\% reduction in occurrence of prostate cancer among men with a history of prior cancers.\textsuperscript{54}

Not all studies, however, show cancer risk reduction with L-selenomethionine by itself.\textsuperscript{55-57} That’s why it is important to include more than just one form of selenium in your daily program. Since the three best-studied selenium compounds differ in the way your body handles them and in their impact on cancer risk, it is important to combine them for maximum protection.

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**What You Need To Know**

Selenium Promotes Longevity

- DNA damage is a major promoter of accelerated aging in the human body.
- Our bodies are well-equipped in youth with mechanisms to protect against DNA damage, but these begin to fail as we age, leaving us vulnerable to the chronic diseases of aging.
- One essential protective system in the body is the enzyme glutathione peroxidase, which depends on the trace mineral selenium for its actions against oxidative damage.
- Studies show that selenium may enhance longevity and reduce the risk of dying from a wide variety of chronic, age-related diseases.
- Appropriate selenium intake may decrease the risks of developing cancer, cardiovascular disease, and cognitive decline.
- Get your blood tested to find out if you are selenium deficient, and begin selenium supplementation as required.
Protecting Against DNA Damage

One of the main ways selenium supplementation helps reduce the risk of cancer is by preventing damage to DNA, which is a major trigger for the transformation of normal cells into malignant ones.54,59

An important approach in cancer prevention has been to focus on the \( \text{BRCA1} \) gene, a tumor suppressor that prevents cells from turning cancerous by repairing damage to DNA strands.53,60,61 Mutations in the \( \text{BRCA1} \) gene reduce its anticancer effect. In fact, women with such mutations have up to an 80% lifetime risk of developing breast cancer, and up to a 60% chance of developing ovarian cancer.82

Because of the high incidence of cancer associated with this gene mutation, many women who test positive for it elect to undergo a preventive mastectomy—one of the most well-known being Angelina Jolie.

Selenium appears to help repair DNA damage caused by mutations in the \( \text{BRCA1} \) gene. This was demonstrated by a study published in *Cancer Epidemiology, Biomarkers, & Prevention*. For the study, women with mutations in the \( \text{BRCA1} \) gene were supplemented with placebo or selenium after precautionary removal of their ovaries and adjacent tissues.53 Researchers found that levels of chemical markers for DNA damage fell markedly in selenium-supplemented women, while markers of successful DNA repair rose.53 These were exciting results because less DNA damage means lower risk for future cancers.

Animal studies show that a diet supplemented with organic selenium compounds such as selenomethionine could also protect against the spread of breast cancer to other parts of the body (metastases), which is the primary cause of death in most cancer patients.63

In 2011, a large meta-analysis (a pooled analysis of results of multiple studies) was able to demonstrate that, among people with low baseline serum selenium levels, selenium supplementation reduced the risk of developing cancer by 36%. In people at high risk for cancer (even with normal selenium levels), supplementation reduced the risk by 32%.28

Selenium Combats Immunosenescence

Aging is associated with increased susceptibility to infections and cancer, and declining immune function plays a major role in this vulnerability. This age-related reduction in immune system vigilance is called immunosenescence.64

Some studies suggest that selenium levels generally decline as we get older, and this may partly underlie immunosenescence.8,19,20

Selenium supplementation has been shown in preclinical research to enhance proliferation of cytotoxic precursor cells, which give rise to the crucial T immune cells that fight cancer and viruses within the body.8,65

Moreover, an intriguing study of healthy men found that selenium supplementation for one year led to increased expression of genes associated with natural killer cell and T-cell cytotoxicity.66

Selenium is also critical for the optimal function of neutrophils,67 which are normally the most abundant type of white blood cell.68 Neutrophils ingest invading microbes and destroy them using an intricate system that is in part regulated by selenium and selenoproteins.69,70 In fact, neutrophils from selenium-deficient animals have been shown to be less effective in killing microbes than those from animals with sufficient selenium intake.8,65

Not surprisingly, selenium supplementation may boost immune system function in aging individuals and confer protection against infections. In one study, elderly individuals who supplemented with selenium (along with zinc) were significantly less likely to develop an infection over a two-year period than those who took a placebo.71

Aside from buttressing immune defenses against infection, selenium also appears able to keep certain viruses from mutating and becoming more pathogenic once they’re inside the body. One group of researchers showed that a normally benign strain of coxsackievirus becomes virulent and damages the heart when administered to selenium-deficient mice. It was determined that replication in the low-selenium environment allowed the virus to directly change its genome to become
Subjects received either a placebo or 200 micrograms of selenium along with their vaccinations. Thirty days after vaccination completion, 74% of the subjects who took selenium had protective levels of anti-hepatitis B antibodies in their blood, while protective antibody levels were found in only 48% of those who received the placebo.78

The Heart Depends On Selenium

Despite mainstream medicine’s costly diagnostics and invasive treatments, cardiovascular disease remains the leading killer of Americans. More than 61 million people in the United States have one or more types of cardiovascular disease, and 600,000 of those people die every year.79,80

There is evidence that selenium supplementation can reduce many of the risk factors that predispose people to heart attacks or other cardiovascular diseases, including oxidative damage and atherosclerosis.

One of the main reasons why selenium deficiency is so damaging to heart muscle is because of the role selenium plays in protecting the heart against free radical damage, a leading risk factor for heart disease.81-83

Selenium is essential to the proper functioning of one of the heart’s most extensively studied protective mechanisms against oxidative stress—an enzyme called glutathione peroxidase.84 This enzyme is 100% dependent on having a selenium atom at its core for proper function.85 In fact, selenium is what gives the enzyme its potency in preventing and cleaning up after destructive oxygen free radicals.
Decreased selenium in the blood leads to decreased glutathione peroxidase activity,\(^9\) which in turn makes heart tissue more vulnerable to the damage that can impair its function.\(^5\) This situation is especially grave in older adults.\(^9,8\)

A study found that adding selenium to human coronary artery cells in culture significantly raised levels and activity of glutathione peroxidase.\(^8\) And in humans, supplementing with 200 micrograms per day of selenium significantly increased glutathione peroxidase activity by 11%.\(^8\)

In a particularly impressive study, 81 heart attack survivors were treated with either 100 micrograms per day of selenium or a placebo for six months (all other cardiovascular drug treatment was continued).\(^8\) As expected, the mean selenium blood concentration rose significantly in the supplemented group but remained unchanged in the placebo group.

But the real difference between the two groups showed up in the number of patients who either had heart attacks or died of heart disease. Four patients who did not receive the selenium supplements died of cardiac disease, while 100% of the patients in the selenium group survived.\(^8\)

**Selenoprotein Synthesis**

...and statins have been shown to significantly reduce the synthesis and activity of glutathione peroxidase.\(^3,4\)

As you just learned, the selenoprotein glutathione peroxidase protects against numerous insults that contribute to life-threatening heart disease.\(^2\)

Indeed, a study of over 600 coronary artery disease patients published in the prestigious *New England Journal of Medicine* found that low activity levels of red blood cell glutathione peroxidase were independently associated with an increased risk of cardiovascular events.\(^9\) Study participants who had the highest levels of glutathione peroxidase activity were 71% less likely to have a cardiovascular event during the study period than participants with the lowest levels of glutathione peroxidase activity.\(^9\)

Fortunately, supplementation with selenium bolsters glutathione peroxidase enzyme activity. A laboratory study found that culturing cells with statin drugs increased their sensitivity to oxidative damage by inhibiting glutathione peroxidase; this effect was reversed by adding sodium selenite to the cells.\(^9,3\)

**Selenium Is Essential For Normal Brain Function**

The brain is very vulnerable to the damage caused by oxidative stress.\(^9,7\)

Excessive oxidative exposure has been associated, both in the lab and in living humans,\(^9,10\) with increased risk of neurodegenerative changes—the same kinds of changes seen in Alzheimer’s, Parkinson’s, and Huntington’s diseases, which are important causes of dementia in the United States.\(^14,95,102,103\) Currently, more...
The lack of oxygen immediately following a stroke (known as ischemia) reduces energy production in the tiny cellular powerhouses known as mitochondria. Mitochondria burn fuel from food, releasing energy that is then stored in a chemical “battery” called ATP (short for adenosine triphosphate). When mitochondria are impaired, they can’t make enough ATP to support brain tissue function.

The negative effects of this energy disruption were clearly seen in a study on laboratory animals. In an animal model of stroke, ATP levels in brain cells dropped significantly, while chemical markers of cellular stress increased. However, when the animals were treated with selenium supplements before the stroke, their ATP levels and levels of stress markers remained near normal, and stroke-induced impairments in behavior were not seen. This remarkable study indicates that having adequate levels of selenium could prevent some of the brain damage caused by a stroke. Microscopic analysis of these animals’ brains showed substantially less swelling between cells and lower rates of infiltration by the immune cells called microglia.

Higher Doses Of Selenium Not Needed

The data showing tremendous benefits in people with the highest selenium levels should not prompt people to take high doses of selenium. The reason is that the selenium contained in scientifically designed multi-nutrient formulas already provides optimal potencies of all three forms of selenium. Commercial multivitamins usually contain only one form of selenium, usually in a very low dose.

Summary

Selenium, a trace element, is essential to the proper function of enzyme systems that protect the entire body from age-accelerating damage. Selenium deficiency has been linked to leading causes of premature death, including heart disease, cancer, and immune senescence. Selenium plays a role in decreasing the risk of cancer and cardiovascular disease, as well as promoting normal brain function.

Optimal daily dosing usually requires about 200 mcg, divided into the selenite, selenomethionine, and selenocysteine forms of selenium.

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


79. Available at: http://www.cdc.gov/nchs/fastats/heart-disease.htm
The Healthy Gourmet Choice

Not all coffee provides the same powerful protection.¹-¹²

When it comes to obtaining coffee’s full range of health benefits, most people aren’t getting their money’s worth!

The reason? Most of the coffee bean’s polyphenol content is destroyed during the roasting process.

Among the most beneficial of these polyphenols is chlorogenic acid, a potent inhibitor of the glucose-6-phosphatase enzyme that stimulates excess gluconeogenesis.

A Patented Organic Roast

Life Extension’s Rich Rewards® Breakfast Blend and Decaffeinated Roast are made using a patented, 100% natural process called Healthy-Roast®.* It delivers a more complete nutritional profile of the coffee bean, yielding chlorogenic acid levels far greater than other premium brands.

Handpicked deep in the rainforests of Central America, Rich Rewards® consists exclusively of 100% USDA certified organic arabica coffee beans, gently roasted in small batches and ground for easy brewing.

Savory Taste Without Stomach Upset

Have you given up coffee because it upsets your stomach? With Rich Rewards®, you can enjoy coffee again. The HealthyRoast® process also preserves special, naturally occurring compounds in coffee that soothe your stomach.

Concerned about caffeine but don’t like the weak taste of decaffeinated coffee? With Rich Rewards® Decaffeinated Roast, you can limit your caffeine intake without compromising on flavor. The caffeine is removed through a completely chemical-free Water Process, which relies solely on water and carbon filters. It delivers the full flavor, aroma, and body of the arabica bean.

Life Extension’s Rich Rewards® coffees give you a uniquely beneficial brew with superior flavor. The Rich Rewards® Breakfast Blend contains up to 87% more chlorogenic acid than conventional caffeinated coffees. Rich Rewards® Decaffeinated Roast contains up to 187% more chlorogenic acid than conventional decaffeinated coffees.

Comparison of Conventional Coffee to Life Extension’s Rich Rewards® Blend

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<th>Chlorogenic Acid</th>
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<tr>
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This chart shows Life Extension’s Rich Rewards® Breakfast Blend contains up to 87% more chlorogenic acid than conventional caffeinated coffees and the Rich Rewards® Decaffeinated Roast contains up to 187% more chlorogenic acid than conventional decaffeinated coffees. This enables one to obtain the benefits of heavy coffee drinking in about half the number of cups.

References

* US Patent 6,723,368.

Rich Rewards® Breakfast Blend
Item #01609 • 12 oz bag

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Rich Rewards® Decaffeinated Roast
Item #01610 • 12 oz bag

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To order either of the Rich Rewards® Antioxidant Coffees call 1-800-544-4440 or visit www.LifeExtension.com
Are You Getting The Maximum Potency From Your Daily Vitamin?

Life Extension® Two-Per-Day formulas are the highest-potency multivitamins on the market. In fact, they have the highest potencies of any science-based multivitamin formula that can fit inside two easy-to-take tablets or capsules.

Compared to Centrum® (the leading multivitamin), Two-Per-Day provides:

- 50 times more vitamin B1
- 12 times more vitamin B12
- 25 times more vitamin B6
- 10 times more biotin
- 10 times more selenium
- 8 times more vitamin C
- 2 times more vitamin D
- Twice as much vitamin E
- Twice as much vitamin B3
- Twice as much zinc
- Three different forms of selenium
- Natural mixed tocopherols
- NIAGEN® Nicotinamide Riboside

Life Extension’s Two-Per-Day contains bioactive forms of vitamin B2 and B6, plus lycopene, alpha-lipoic acid, and natural mixed tocopherols. Two-Per-Day also contains three different forms of selenium, each having its own unique beneficial function in the body.

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### Compare CENTRUM® to TWO-PER-DAY:

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<tr>
<td>Alpha Lipoic Acid</td>
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<td>25 mg</td>
</tr>
<tr>
<td>Natural Mixed Tocopherols (providing gamma, delta, alpha, and beta tocopherols)*</td>
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<td>20 mg</td>
</tr>
<tr>
<td>NIAGEN® Nicotinamide Riboside**</td>
<td>(none)</td>
<td>1 mg</td>
</tr>
</tbody>
</table>

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**NIAGEN®** is a registered trademark of ChromaDex, Inc., Patents see: www.ChromaDexPatents.com. **NIAGEN® Nicotinamide Riboside** (none) 1 mg

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To order **Life Extension Two-Per-Day Tablets** or **Two-Per-Day Capsules**, call 1-800-544-4440 or visit www.LifeExtension.com

*These statements have not been evaluated by the Food and Drug Administration. These products are not intended to diagnose, treat, cure or prevent any disease.*
Super Selenium Supports
HEART & BRAIN HEALTH

Linked to Longevity

Studies show that the trace mineral selenium is an important common denominator among some of the world’s oldest people.1

Selenium’s longevity power comes from its ability to fight one of the primary causes of premature aging: oxidative damage. As a result, selenium offers powerful protection for critical factors throughout the body, including heart support, brain support, and healthy cell division.2,3

With Life Extension’s Super Selenium Complex, you’ll be arming yourself with the same powerful protection experienced by the world’s longest-living people!

Super Selenium Complex has three different forms of selenium—each of which uniquely acts along a different pathway to support healthy cell division.

- Sodium selenite
- L-selenomethionine
- Selenium-Methyl L-Selenocysteine

Super Selenium Complex combines all three of these unique forms of selenium for optimized selenium support! And best of all? Since each bottle will last over three months, the cost to take this advanced selenium complex is less than $3 a month!

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To order Super Selenium Complex, call 1-800-544-4440 or visit www.LifeExtension.com

These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease.
In 1937, the Nobel Prize in Physiology was awarded to Albert Szent-Gyorgyi for his research on vitamin C. At the time, vitamin C was a rare commodity and could only be extracted from adrenal glands or massive amounts of orange juice.

Szent-Gyorgyi’s discoveries helped launch an onslaught of vitamin C research, especially into its ability to enhance immune function. The human body does not produce vitamin C. It must be obtained from outside-the-body sources. Water-soluble vitamin C is quickly excreted.¹ That’s why it makes sense to supplement daily with vitamin C to ensure the body has the protection it needs.

Aging individuals tend to have lower levels of vitamin C circulating in their bloodstream and immune cells.²,³ This can lead to impaired immune function.⁴,⁵

While vitamin C helps maintain tissue and speed wound healing, an overlooked strength is its impact on boosting immune function. As you will read in this article, people with common diseases have lower vitamin C blood levels than healthy individuals.

With the growing body of data about the role that plant-based nutrients play in healthy aging, we sometimes forget about how much documentation exists in support of vitamin C, a nutrient found in small concentrations in certain plant foods.

New evidence is corroborating what scientists long ago advocated relating to the need for humans to maintain optimal vitamin C status.
The Importance Of Vitamin C

Vitamin C deficiency has been associated with frequency and duration of colds, along with immune system defects.6 While colds aren’t usually dangerous in themselves, they can lead to pneumonia and other respiratory diseases, especially for aging individuals.7 Colds can be an early indicator of gaps in immune function that could leave one vulnerable to a cascade of serious infections.

A deficiency of vitamin C broadly affects the various key aspects of immune function, which include the innate system we are born with, the adaptive system that develops from infancy to young adulthood, the cells that kill invaders, the cells that coordinate those attacks, and even the production of antibodies that fight known infections.

As a result of vitamin C’s wide-ranging impact on the immune system, a deficiency could leave us vulnerable to infections.5 A weakened immune system caused by low vitamin C levels can make any infection more serious. This danger becomes more ominous in older adults, in whom the phenomenon of immunosenescence (the aging of the immune system) already heightens risk.8

There are multiple causes of insufficient vitamin C. Aging is one major cause of lowered vitamin C levels.3,2 The concentration of vitamin C in immune cells decreases with age, partly the result of an increasingly oxidative environment that consumes vitamin C. This can lead to damage to DNA, proteins, and fat molecules needed for normal immune function.4,5

Stress is another major trigger for reducing vitamin C levels, leaving the affected individuals vulnerable to infection at precisely the time that stronger immune support is needed.4,5,9

In some remarkable human findings, low vitamin C blood levels have been associated with a number of common human diseases.5,10 The table below shows higher plasma vitamin C levels in healthy individuals compared to those with serious diseases, most notably cancer and sepsis.

**TABLE: Vitamin C Levels Fall In Multiple Disease States**

<table>
<thead>
<tr>
<th>Vitamin C In Disease States</th>
<th>Mean Plasma Vitamin C Level (micromol/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes</td>
<td>42 mmol/L</td>
</tr>
<tr>
<td>Gastritis</td>
<td>46 mmol/L</td>
</tr>
<tr>
<td>Pancreatitis</td>
<td>33 mmol/L</td>
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<tr>
<td>Pneumonia</td>
<td>31 mmol/L</td>
</tr>
<tr>
<td>Cancer</td>
<td>&lt; 24 mmol/L</td>
</tr>
<tr>
<td>Trauma or sepsis (overwhelming infection)</td>
<td>10 mmol/L</td>
</tr>
<tr>
<td>Arthritis</td>
<td>27 mmol/L</td>
</tr>
</tbody>
</table>

A healthy vitamin C level is considered to be between **61** and **80 micromol/L**. Those afflicted with serious diseases have much lower vitamin C levels. It is likely that the inflammation and oxidative stress caused by some of these diseases contributes to this reduced vitamin C since it will rapidly be used up quenching free radicals. It’s also possible that lower levels of vitamin C contributed to the development or progression of some of these disorders.

**Why The Immune System Depends On Vitamin C**

One of the most important functions of vitamin C is to support and energize the body’s immune system. Immune cells have active vitamin C transporter molecules embedded in their membranes that actively pump the vitamin into the cells when more vitamin C is required.5,11

For example, during times of inflammation or infection, those transporters ramp up their activity to provide sufficient vitamin C to the cells’ inner workings, causing cells to attain levels up to **100-fold** that of the plasma level. This is why blood levels of vitamin C drop during times of disease or infection (see Table above).5,11
This can create a potentially vicious cycle in which, just when you need extra vitamin C, your body's stores are depleted. This also makes it especially important to increase one's intake of vitamin C when sick.

The content of vitamin C within immune cells is closely related to those cells' activity, especially in the case of specific cells that engulf and destroy infecting organisms (phagocytes) and of those that recruit, organize, and direct other immune cells (T-lymphocytes). 11

Fortunately, you can improve your immune system's function by supplementing with vitamin C. 4,6,8,12 The recommended daily allowance of vitamin C is around 90 mg per day. For optimal immune function, many experts now recommend supplementing with 1 gram (1,000 mg) of vitamin C daily in addition to a diet rich in fruits and vegetables. 13

Human studies have shown that this amount of vitamin C can not only reduce the duration and severity of the common cold—but can reduce the incidence of developing a cold as well. Not all common cold studies produce consistent results. This means more than vitamin C alone is needed to combat common colds, such as using the right dose of zinc acetate lozenges as soon as cold symptoms manifest.

Reduce The Duration And Severity Of Colds

One of the best-known uses of vitamin C is in the prevention and treatment of the common cold. 14 While for young people a cold is little more than a nuisance, in older adults, colds can herald the onset of serious bacterial infections such as pneumonia or bronchitis, both of which increase the risk of premature death.

There is no shortage of research demonstrating that vitamin C can reduce symptoms and shorten duration of the common cold. 4,15 Studies show that vitamin C supplementation can reduce the duration of colds by anywhere from 5 to 21%. 15

Vitamin C supplementation has also been shown to significantly reduce the severity of cold symptoms. And in older people who require hospitalization for pneumonia and chronic bronchitis, even a dose of just 200 mg per day was shown to reduce the clinical severity of the illness. 4

Vitamin C Reduces Incidence Of Colds

While the evidence demonstrating the ability of vitamin C to reduce the duration and the severity of colds is clear, the question of whether vitamin C supplementation could also reduce the incidence (rate of occurrence) of colds has been fiercely debated. 16 Newer studies using higher doses of vitamin C show that vitamin C can, in fact, reduce the incidence of colds.

What You Need To Know

Vitamin C Supports The Immune System

- Older adults are at ever-increasing risk of serious infections or cancers as their immune systems age.
- An intact immune system relies upon many layers of protection from multiple cell types and a host of immunologically active signaling molecules.
- The function of those specialized cells and molecules is being increasingly found to depend on adequate supplies of vitamin C in the body.
- Roughly 23% of Americans have vitamin C depletion, causing their immune systems to not function properly. 44
- Studies show that doses of vitamin C at 1,000 mg per day can effectively restore function to myriad components of the immune system.
- New studies confirm that vitamin C supplementation at 1,000 mg per day shortens the duration and mitigates the severity of colds, while also preventing colds from developing, especially in those with low vitamin C levels.
- Take a 1,000 mg per day supplement to optimize your immunity and potentially lengthen your life.
Studies using 1,000 mg or more have shown that vitamin C reduces cold incidence by a remarkable 50% among people undergoing heavy stress, such as soldiers and athletes.4,15,17 These studies found that the people who had the lowest dietary intake of vitamin C had the greatest benefit.

In 2014, a study of vitamin C published in the journal *Nutrients* provided definitive evidence that vitamin C supplementation can reduce the incidence of the common cold in otherwise healthy people with chronic stress or obesity.6 The study included 18- to 35-year-old men who had vitamin C levels of less than 45 micromol/L (61 to 80 is considered adequate). The study lasted eight weeks, and scientists recorded scores on a physical activity scale and tracked the occurrence of cold episodes.

During the study, 85% of placebo recipients experienced a cold compared with just 47% of supplemented subjects, a statistically significant difference and a risk reduction of 45%.6 Reduction in cold duration was also significant in the supplemented versus the control group, with supplemented subjects experiencing an average of 3.2 (59%) fewer days with cold symptoms than placebo subjects. Intriguingly, supplemented subjects’ physical activity scores also rose by 40% compared with placebo recipients, strongly suggesting that supplementation was correcting hidden symptoms of vitamin C depletion, such as fatigue and malaise.

Even more impressive, at least three controlled studies also show that vitamin C supplementation can reduce the incidence of pneumonia by as much as 80%.15 This is a crucial finding for older adults since the death rate for elderly people with pneumonia exceeds 16%, even with antibiotic treatment, highlighting the urgency of prevention.16,19

Emerging Areas Of Vitamin C Importance In Human Health

This article primarily considered the role of vitamin C in supporting the immune system, particularly in aging or stressed individuals. There is growing support, however, for use of vitamin C in these other areas as well:

- **Diabetes:** Diabetes induces powerful oxidant stress throughout the body, leading to inflammation and loss of function. Studies now show that vitamin C status may influence the incidence of type II diabetes, the accelerated cognitive decline of diabetics, the anxiety, depression, and stress experienced by diabetics, and the risk of atrial fibrillation in diabetics.45-48

- **Cardiovascular disease:** Heart disease and stroke have many causes, but oxidant damage and inflammation lead the pack.49-53 Studies now show vitamin C improves endothelial function (function of the active lining of blood vessels that controls blood flow and pressure) and potentially other areas of cardiovascular medicine.54-56

- **Anemia:** There is evidence from animal studies that vitamin C can prevent the kind of anemia that arises from excessive iron, which can be seen in older adults.57

- **Periodontal disease:** Bleeding gums and tooth loss were common symptoms of scurvy that were readily reversed with vitamin C supplementation. Today’s scientists are demonstrating a role of vitamin C in preventing less obvious, but still important causes of tooth loss in older adults, such as gingivitis.58

- **Osteoporosis:** Vitamin C is an absolute requirement for normal formation of bone proteins, and preliminary studies are showing the potential of the vitamin in preventing bone loss and fractures related to osteoporosis.59,60
Vitamin C And Immunity: Details From Laboratory Studies

The aging of the immune system (immunosenescence) can leave older individuals vulnerable to infection and disease that wouldn’t be an issue for younger people. Laboratory studies indicate that vitamin C can restore an aging immune system to that of younger individuals.

An abundance of laboratory studies show that vitamin C can boost immune function, particularly in older people. One particular study demonstrates this perfectly. White blood cells from elderly people typically perform poorly in response to stimulation by foreign material (antigens). However, a study published in the International Journal of Immunopharmacology showed that incubating these white blood cells overnight in a solution enriched with vitamin C restored the performance levels of these cells to that of normal cells from younger people.

In fact, vitamin C produces beneficial effects on virtually all of the immune system’s cells.

• **Natural killer (NK) cells.** These “hit men” of the immune system move in on infectious and malignant targets that have been identified as foreign by other immune system components. Like other immune cells, NK cells’ function declines with aging. Detailed scientific studies show that NK function improves in the presence of adequate vitamin C, and declines without it. Vitamin C helps NK cells track and destroy tumor cells as well by reducing the shielding effect of platelets (blood clotting cell fragments) that would prevent NK cells from destroying them. This effect may help to prevent cancers from producing deadly metastases.

• **Neutrophils** are the main immune system cell for fighting bacterial infections. Neutrophils engulf invading organisms, then destroy them with powerful blasts of short-lived oxygen free radicals. Vitamin C supports many aspects of neutrophil function, aiding in their ability to chase down bacterial targets and improving their ability to engulf and kill such targets. Since the bacterial killing process creates potent oxidation products, neutrophils would destroy themselves in short order without ample vitamin C, which scavenges up the dangerous oxidizing molecules once they have done their work to destroy the bacterial cell.

A study published in the Canadian Journal of Physiology and Pharmacology showed that when human volunteers took an oral dose of 1,000 mg or more of vitamin C, neutrophils performed more vigorously than those of unsupplemented subjects.

Improved function of neutrophils in the presence of adequate vitamin C is so evident that clinicians have begun to use vitamin C at 1,000 mg per day doses for people with chronic granulomatous disease, a disorder in which neutrophils lack proper killing ability once they have ingested bacteria. Similar improvements in neutrophil performance have been shown in the much larger population of people with asthma, another condition in which neutrophil impairment can worsen patients’ clinical status.

• **Lymphocytes** are immune system cells that produce antibodies (called B-lymphocytes) and coordinate with other immune cells to guide them towards threats needing destruction. When they detect such an incipient threat, lymphocytes rapidly reproduce in a proliferative response that is enhanced in the presence of vitamin C. In older adults, that proliferation is impaired, but vitamin C treatment restores them to youthful levels of function. Similar enhancements of lymphocyte proliferation have been demonstrated by supplementing aging laboratory animals with vitamin C, which also boosts lymphocytes’ ability to track down threats.

Diabetes, like aging, impairs the production of lymphocytes and the functioning of T-lymphocytes. However, supplementing diabetic rats with vitamin C pushed lymphocyte production from 57% of that of controls to virtually 100% of control values, essentially creating “nondiabetic” immune cells within a living diabetic body.

• **Antibodies** are noncellular components of the immune system that help identify and destroy invading threats and cancerous cells. Vitamin C benefits this portion of the immune system by raising levels of three main classes of antibody immunoglobulins: IgA, which protects against infections mainly on mucosal surfaces, such as the respiratory and digestive tracts, IgG, which provides long-term protection in the bloodstream, and IgM, which is the earliest immunoglobin to appear in blood in response to threats. Blood levels of antibodies and other protective molecules rose significantly when volunteers took 1,000 mg doses of vitamin C daily for 75 days, demonstrating the effect in humans.
All major immune system cell lines function at their peak with ample vitamin C supplies. With inadequate intake or plasma levels, those cells are less able to detect, track, and kill invading organisms or pre-cancerous cells. That means that vitamin C depletion can leave one vulnerable to dangerous infections.

New studies are helping to confirm that vitamin C supplementation can reduce duration and severity of the most prevalent respiratory infection, the common cold, and makes it less likely one will catch a cold in the first place.

Given the health risks associated with adults who develop pneumonia after a cold, prevention with adequate vitamin C (1,000 mg and higher daily doses) looks more promising. This dose, greater than what can fit into most multi-nutrient formulas, will assure you are obtaining sufficient vitamin C to emulate studies documenting improved immune function, protection against the common cold, and other age-related disorders.

If you have any questions on the scientific content of this article, please call a Life Extension® Health Advisor at 1-866-864-3027.
VITAMIN C AND OPTIMAL IMMUNITY

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Experience Tranquility

OVERSTRESSED? LOSING SLEEP?

Left unchecked, the inner turmoil created by these issues can lead to heart palpitations, muscle weakness, headaches, and even increased blood pressure. You need to take action to halt these symptoms immediately.

Fortunately, Life Extension® has created Natural Stress Relief, a calming formula made with lemon balm and L-theanine, two ingredients clinically proven to help promote sleep and relaxation.1

The Cyracos® lemon balm extract used in this product is prepared from a special lemon balm chosen for its high concentrations of hydroxycinnamic and rosmarinic acids. These potent constituents may be mood enhancers that relieve everyday stress and alleviate sleep problems.1

L-theanine, an amino acid derived from green tea, is a natural relaxant that has been used by the Japanese for years. Those who have taken L-theanine compare it to a massage, meditation session, and aromatherapy rolled into one.2

Based on a tremendous amount of published data, Life Extension® combined these two ingredients with the idea of providing the ultimate calming experience. Try it today.

Each vegetarian capsule of Natural Stress Relief provides:

- 300 mg of Cyracos® lemon balm extract
- 200 mg of Suntheanine® L-Theanine

Note that the amount of L-theanine in this product is double that of most L-theanine stand-alone supplements. The reason for this potency increase is reports of greater benefit when at least 200 mg of L-theanine are taken.

References:

Contains rice.

BEWARE OF IMITATIONS: The L-theanine used in the new Natural Stress Relief is Suntheanine®, the only pure form of L-theanine available worldwide and the only form protected by over 40 internationally recognized patents and scientifically proven in clinical studies to be safe and efficacious. Independent laboratory analysis has verified that certain other products on the market claiming to contain "L-theanine" are only half L-theanine, the other half being a different form of theanine known as "D-theanine" that has not been scientifically evaluated in published studies. Suntheanine® is a registered trademark of Taicho International, Inc. Use of Suntheanine® is protected by US Trademark Registration No. 2,548,957. Cyracos® is a registered trademark of Naturex.

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

To order Natural Stress Relief with Lemon Balm and L-Theanine, call 1-800-544-4440 or visit www.LifeExtension.com

Natural Stress Relief
Item #00987 • 30 vegetarian capsules

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<th>Price</th>
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<tr>
<td>1 bottle</td>
<td>$36</td>
</tr>
<tr>
<td>4 bottles</td>
<td>$29 each</td>
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</table>
Despite a healthy diet and exercise, aging individuals often find themselves under assault from rising **blood sugar** levels due to a multitude of factors such as:

- Excess **gluconeogenesis**, (glucose produced in the liver from protein)¹
- Rapid conversion of any **starch**—including whole grains—into **glucose**²

An all-natural, **multi-pronged** approach has been designed to support the natural balance of key **glucose pathways**!

**Tri Sugar Shield®** is designed to support healthy glucose metabolism in aging individuals within the normal range.

### **TRI SUGAR SHIELD®**

#### THREE ACTIVE NUTRIENTS

**Sorghum Extract**

Sorghum helps maintain healthy blood sugar levels among those in normal range by:

- Balancing the rate of sugar manufacture in the liver³
- Promoting insulin sensitivity⁴
- Regulating **PPAR-gamma**, a metabolic thermostat that controls glucose metabolism⁵,⁶
- Regulating **alpha-amylase**, which controls the release of sugar from starch⁷

**Mulberry Leaf Extract**

Mulberry leaf extract targets **two** different mechanisms by:

- Supporting glucose transporter **GLUT4** that moves glucose out of the bloodstream and into muscle and liver cells⁸
- Promoting insulin sensitivity⁹

**Phloridzin**

Phloridzin helps maintain healthy blood sugar levels among those in the normal range by:

- Regulating carrier protein **SGLT1**, helping to block absorption of glucose into the bloodstream⁰
- Regulating carrier protein **SGLT2**, in turn supporting glucose elimination via urine¹¹

By targeting all of these diverse glucose pathways, **Tri Sugar Shield®** delivers broad-spectrum support to help naturally stabilize already healthy glucose levels!

### **Tri Sugar Shield®**

**Item #01803 • 60 vegetarian capsules**

<table>
<thead>
<tr>
<th></th>
<th>Retail Price</th>
<th>Your Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 bottle</td>
<td>$36</td>
<td>$27</td>
</tr>
<tr>
<td>4 bottles</td>
<td>$24 each</td>
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Take one capsule twice daily immediately before the heaviest carbohydrate or sugar containing meals/drinks.

**References**


**Non-GMO**

**Caution:** If you are taking blood glucose-lowering medication, consult your health care provider before taking this product.

These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease.
Vitamin C is essential for life because the human body cannot synthesize it. During stressful events, plasma and white blood cell vitamin C levels decrease.

Numerous studies have demonstrated that vitamin C supplementation supports healthy immune function, including cell mediated immunity and neutrophil function. Vitamin C promotes the body's natural protection against oxidative damage to lipids, proteins, and DNA.

Life Extension introduces daily C+, a citrus-flavored, effervescent drink mix that provides a blend of 1,000 mg of vitamin C and other essential vitamins and minerals in individualized packets—ideal to take ‘on the go’ to support your immune system and general health.

With each delicious sip, you obtain 18 different nutrients—including vitamin C, B vitamins, and electrolytes:

- 1,000 mg of vitamin C combined with vitamin D3, zinc, quercetin, and other nutrients to support your immune system.
- Seven B vitamins, including B1, B2, B3, B6, and B12, that boost energy naturally—no caffeine, no crash.
- Bioactive forms of riboflavin, vitamin B6, and vitamin B12.
- Electrolytes to replenish those lost through perspiration, especially during workouts.

New daily C+ has just 15 calories per packet. It is sugar-free, sodium-free, and naturally sweetened with stevia and monk fruit extract. Adults can take one packet up to two times daily mixed in 4-8 ounces of cold water, according to taste.

To order Life Extension® daily C+, call 1-800-544-4440 or visit www.LifeExtension.com

References

Non-GMO

These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease.
IMPROVE YOUR ODDS OF SUCCESSFUL CATARACT SURGERY
Each year, 3 million Americans have cataract surgery. More than 98% of these procedures are successful. Considering the number of aging people who used to face inevitable blindness from cataracts, the advent of modern cataract surgery represents a true miracle of medicine.

The official published number is that only 0.5% of cataract surgery patients encounter severe postoperative complications such as blindness. However, there is considerable underreporting, so the true number could be somewhat higher.

While the published number is low, it still represents 15,000 Americans every year who lose their eyesight because of a failed cataract surgery.

What these statistics do not show is the fact that even in successful cases, some surgeons consistently get better vision results for their patients.
To avoid being among the 15,000 who have serious complications, including unnecessary blindness from cataract surgery, it is important to learn how to select your eye surgeon. While most surgeons are good, some are definitely better than others.

The most independent source as to which ophthalmologist (eye surgeon) is the best surgeon is a good optometrist. They do not do surgery but refer many patients for surgery and co-manage the patient after the surgery. The last thing they want is to send a loyal patient to a bad surgeon.

Optometrists see the complications of an unsuccessful surgery and generally know what surgeons are bad, good, and really good. But you have to inquire the correct way in order to get that information. For example, ask who your eye doctor would send his or her family to instead of asking if a specific doctor is good or bad. Asking if a certain surgeon is “good or bad” puts the doctor in an uncomfortable position as he or she may be co-managing a number of patients from the surgeon you are inquiring about.

While there are no guarantees of a favorable outcome, surgeons that own and control their own surgery center and only do cataract surgery generally have a higher success ratio than those that do different kinds of surgery and use the hospital for their surgery facility. When the surgeon uses a hospital facility, they generally cannot control the type or kind of equipment available, the training of the nurses, the times available for surgery, the placement of equipment, or even which nurses will be available for a given surgery. There are many conditions besides the surgeon’s skills that can affect success or failure. A cataract surgery center recommended by your optometrist is more likely to produce a consistently better outcome.

Some hospitals, however, do have good equipment and surgeons. A growing trend is for hospitals to buy out successful medical practices so higher rates can be billed to insurance. This trend has brought some successful and skilled surgeons into the hospital environment wherein they work for the hospital. However, make sure that you fully research the surgeon you are going to use.

If you have other eye conditions or diseases such as diabetic retinopathy, glaucoma, history of injury to the eye, or any other known serious condition, make sure to see a doctor who specializes in that condition before your cataract surgery. These doctors will know the risk associated with your condition related to
Do not hesitate to contact the state board to see if any action has been brought concerning the doctor you are thinking of using. Your selection of a doctor is serious and perhaps a life-altering decision. Make it carefully.

**Summary**

While 98% of cataract surgeries are successful, 15,000 people still lose vision following surgery each year. To choose a well-qualified surgeon, ask a trusted optometrist. Find one who controls his or her own surgery center rather than who performs surgery in a hospital where outside conditions may affect a surgery’s success or failure. Those suffering from another eye condition or disease need to see a surgeon who specializes in that condition before having the operation. ●

The article that follows this one is written by Patricia Faloon, the mother of William Faloon, who describes what went terribly wrong with her cataract surgery in the hands of a poorly qualified doctor. You will learn what anyone contemplating cataract surgery should do ahead of time to help ensure a successful outcome.

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

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**What You Need To Know**

**How To Have Successful Cataract Surgery**

- Three million Americans have cataract surgery each year. While over 98% of these procedures are successful, 15,000 patients lose their eyesight because of a failed cataract surgery.

- A good optometrist is your best source for finding the best surgeon. A cataract surgery center owned and controlled by the surgeon generally produces a better outcome than a hospital.

- If you have an eye condition or disease such as diabetic retinopathy, glaucoma, history of injury to the eye, see a doctor who specializes in that condition before your cataract surgery.
Cataract Surgery

Beware...
Be Aware
Do you think I want to scare you? You bet I do! I would gladly save someone the fear, pain, and blindness I have endured.

I want to share my experience about a sight-robbing cataract surgery outcome that could have been prevented.

My first cataract surgery left me blind in one eye. After the botched procedure, I visited numerous ophthalmologist surgeons and found out about the mistakes my first doctor should have never made.

**My Story Begins**

In 2013, I found out my eye doctor had retired. He had performed two successful cataract surgeries on my late husband and I had been going to this doctor for over 25 years. I didn’t know the new doctor who took over his practice, whom I will call Dr. X. So, I obtained all my history records from this office in search of an ophthalmologist I could trust my vision to.

In the meantime I met a friend who had both cataracts done successfully by Dr. X. Everything went fine with my friend. So, ignoring my first instinct, I decided to have Dr. X examine my eyes. He told me I was a candidate for cataract surgery and he would do my right eye. I explained to him that my career as a professional clown takes me to all kinds of locations and I need to be able to see not only the street signs, but the intricate face painting I perform. Dr. X said these problems would be solved with the surgery. I decided to have him do the cataract surgery.

Like most people, I thought this surgery has become so routine that they were all successful. I wish I had heard some “bad” stories like mine. I’m sure I would have done more research.

**The First Surgery**

July 17, 2013, was the day of my surgery. I was told by many that this operation took about 15 minutes. I had no idea I would be in for an ugly surprise.

I was sedated for about 20 minutes. It soon became more like 45 minutes. The anesthetic had worn off and I was suddenly waking up and heard scrambling, as well as nervous talk above my head. I said, “Is everything okay?” The doctor mumbled something about a lens.

That evening I was having so much pain that my daughter tried to call the doctor, but she couldn’t reach him. He finally called back near midnight. He said there was no use in going to the hospital since it would take too long for an eye doctor to get to the emergency room to see me. He said he would see me in the morning. Pain and scary images of black and white designs were swirling and flashing in my affected eye. It didn’t stop all night. It was so frightening and I knew something was terribly wrong.

The next day when the bandage was taken off, my vision was not good. There were dark brown pieces throughout my visual field. Dr. X told me to use several types of eye drops during the day. He said that because of a “saggy bag” behind my eye he had to put the lens in the front, instead of behind my eye, which is the usual cataract procedure.

I and my family were all getting a bit frantic by this time. My eye was bloody and irritated and my vision severely impaired.

On July 22 (five days after my surgery), I had a 10:15 appointment to see Dr. X. I told the doctor my eye felt scratchy and asked if it could be the stitches. He said no, it was just dry and gave me a little bottle of eye drops.

At 4:10 that same day, I got an appointment with an ophthalmologist specialist to see if he could help me. I told this specialist about the drops for the scratchy eye. After examining my eye he said it wasn’t dry, there were stitches left in the eye from the surgery and that was what was causing the unbearable scratchy sensation.

This doctor was able to see remnants of lens particles still present in my eye, which apparently can happen after surgery. I had to undergo another surgical procedure with this new doctor to remove these particles. My eye still was a bloody, irritated mess. I was having a terrible time with bright lights and sun. In order to see, I needed to keep the eye squinted or closed.

**Finding A Surgeon With Special Talent**

Fortunately for me, I was able to relate my ordeal to a health professional in another field. When she saw and heard about my eye, she told me about a specialist from Allegheny General Hospital in Pittsburgh. His name is Garry Condon, MD, and he had a great reputation for solving complex problems. The difficulty was I couldn’t get an appointment until September 20th. I had to endure the pain and vision loss for two more months.

Dr. Condon ran a number of tests. He said my eye had been traumatized by the surgery, and remained inflamed. I should never have discontinued the steroid drops, which one of the doctors had prescribed. My eye was constantly inflamed. Dr. Condon was hoping the affected eye would settle down and regain some better vision.
For the next three months, there would be many tests. I believe all the doctors were puzzled. They reviewed my complete eye history. On November 5th, Dr. Condon pulled out another stitch. On December 10th, Dr. Condon’s colleague did an exam. He guessed that a blood vessel or nerve had been damaged during surgery.

I have had to accept the fact that this eye was going to be permanently blind from the surgical errors. The central vision is blurred and gray. I cannot see the face. Tests, tests, and more tests. I believe all the doctors were puzzled. They reviewed my complete eye history. On November 5th, Dr. Condon pulled out another stitch. On December 10th, Dr. Condon’s colleague did an exam. He guessed that a blood vessel or nerve had been damaged during surgery.

I have had to accept the fact that this eye was going to be permanently blind from the surgical errors. The central vision is blurred and gray. I cannot see the face. As a clown, painting faces I never needed glasses. I do now. The anguish and frustration of having my left eye done has been a worrisome ordeal.

I was somewhat confident, however, that I had now found an ophthalmologic surgeon with special talent.

My Letter To The Doctor Who Blinded Me
On January 23, 2014, I wrote this letter to Dr. X.

It has been over six months since you did cataract surgery on my right eye. For me, it has been a dismal outcome.

During the surgery, I was not given enough anesthetic. I was awake the last 10 minutes of a 45-minute operation. I could hear you talking. I asked if everything was okay. You said something about a lens. I literally felt the last four stitches…and it was excruciating! Then you mildly “slapped” the eye patch onto my eye. I asked, as you were walking away (with your BACK to me), “Is everything going to be okay? You kept walking away and said, “It’ll take time…a long time.”

That night I experienced “horrible” images as I tried to sleep. There was pain and symptoms of a detached retina. We tried getting in touch with you for three or four hours. I was ready to go to the emergency room when you called back.

When I saw you the next day, you attempted to reassure me that everything was normal. The fact that I could barely see and that my eye was inflamed with stitches you forgot to remove should have told you that everything was not okay. I couldn’t see.

I have now been to four specialists. Tests, tests, and more tests. I was told my eye was traumatized (wounded, injured, and inflamed). After these four specialists, we are still trying to figure out what went wrong and if I can regain any eyesight at all from this “routine” operation. I am now dealing with a guess as to what is happening. Maybe it’s an injury to my optic nerve and a blood vessel not getting the blood supply. I still cannot see clearly out of my eye. A very respected and esteemed specialist, in his evaluation, has determined that based on the structure of my eye, the risks far outweighed any benefit of even having the eye surgery. I should have been guided to wait for the surgery.

I’m not looking to sue you…but, in all fairness, if I have to start paying for any treatment pertaining to my eye, I am going to request that you pay for it.

So angry and disappointed,
Patricia Faloon

Should I Have Cataract Surgery On My Remaining Eye?

My dilemma was that I needed cataract surgery on my other eye. The botched surgery that blinded my right eye left me very frightened to consider doing the left eye.

I have (I thank God) been an independent, active person all of my life. At age 85, I’m still alert, agile, and physically able to perform as a professional entertainer. I’ve been health conscious my entire life. Now my other eye needed surgery. What really scares me is the possibility that I might now need constant care by a health aide because of my lack of vision due to my botched operation. We all value our independence as long as we live.
On March 12, 2015, I called Dr. Condon. There was no change in my blinded right eye, but I could tell that I needed cataract surgery for my left eye. I was really scared of another failure and that I could wind up completely blind.

Dr. Condon gave me a pamphlet that described “Exfoliative Glaucoma.” At first it frightened me. As I read it, I finally understood my problem. It described “an accumulation of protein in the drainage system and other structures of the eye.”

An important reason to know whether exfoliation is present is that these patients sometimes have increased difficulty with cataract surgery. According to the pamphlet, “The abnormal protein seen in this condition settles and weakens the lens zonules, which are suspensory fibers that hold the lens in place. In most cases the surgical techniques can be modified to obtain a good outcome.”

In reviewing my eye history charts, from 1999, 2001, 2007, 2009, my original doctor (before Dr. X) noted exfoliative glaucoma pertaining to my eyes and wrote “not ready for surgery.” In other words, none of this had to happen. I could still have all my vision if Dr. X had simply done a proper exam before rushing me into surgery.

In my research, I have read that “in the case of exfoliative glaucoma, the findings from a slit lamp eye exam are often characteristic, and so readily seen when the eye is dilated.”

I was never told about this. Why didn’t Dr. X see this? He could have been prepared for this or properly referred me to a cataract surgeon with specialized equipment and expertise for this difficult cataract procedure.

The Second Cataract Surgery

The operation on my other eye was scheduled for April 1, 2015, with Dr. Condon. I was mildly sedately but awake for the operation.

I was stunned with happiness when it was over. I could see (very well) immediately. No bandage on my eye. My evening and next day were joyful! Dr. Condon said: “I kept the anatomy of the eye as intact as possible. I put your lens behind where it should be. I had to work with it, but it all worked out. Usually with your condition of exfoliative glaucoma, you will find the ‘high’ pressure a problem. In your case the pressure is staying low, which is a good thing.”

Dr. Condon told me he was not concerned with glaucoma at this point. Unlike Dr. X, I was called the night of the surgery checking to see if everything was okay. Needless to say, the surgery on my second eye was a success and I could have spared myself blindness on my first eye if Dr. X had bothered to read my medical history.

Finding Out About Dr. X Too Late

I believe Dr. X was untrained in knowing what procedure to perform. I believe he was not prepared and went into a “panic” mode as he encountered my situation. He didn’t attempt to strengthen what holds the lens in place, and instead removed it and placed the new lens in front.

I was left with a “horrible” mangled eye, which several doctors could not figure out. And so, have what is probably considered a “legally” blind right eye.
On August 28, 2015 an investigator came to my house to conduct an inquiry into the allegations about my cataract problem. The investigator seemed to feel my complaint had merit. He would begin by having a legal meeting with Dr. X.

My wishes are that he is forced to refer complicated cases like mine to a surgeon and facility that has the expertise/equipment to properly perform the cataract procedure.

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

To find a qualified Vision Source optometrist, visit www.visionsource.com.

What I Now Know About Cataract Surgery

A cataract surgery can be an extremely simple procedure for many. In other instances, however, it can end up having an irreparable outcome when performed by the wrong doctor. As in any profession, there are those who “get by” with the knowledge that was imparted to them in school, and then there are the professionals who receive their degree but realize learning never stops.

The safest route is to first see a qualified “Vision Source” optometrist. Vision Source is a nationally recognized organization that lists private practices that must continue to complete higher levels of education and have within their practice the latest technologies to diagnose a problem properly. They would have been able to properly diagnose my pre-existing condition of exfoliative glaucoma and would have known who to refer me to as a result. We must become our own health advocates in order to survive in today’s health care world!

I can only suggest that patients do their utmost due diligence in investigating an ophthalmic surgeon whose skill level will determine if you will see clearly immediately after cataract surgery, or if you will you be rendered blind in one eye as I am.

I hope I have scared enough people into doing the research for a happy and successful cataract surgery. Trust me; it is worth the time and energy.

As far as Dr. X is concerned, he can probably perform general ophthalmology exams and earn a decent living. From everything I have learned about him, however he should not be doing eye surgery. With Medicare paying over $3,000 per eye, I suspect Dr. X will continue his lucrative practice.

Complications with cataract surgery can be avoided. Ophthalmologists should be prepared for problems and if they don’t have the expertise for a solution, should be ready to recommend a doctor who does. My blindness could have been prevented.

I put in a formal complaint against Dr. X. to the Commonwealth of Pennsylvania Office of General Counsel in Harrisburg, Pennsylvania.

Technical Comments About The Botched Surgery

Dr. X appears to be incompetent and appears to be using surgery techniques that were discontinued years ago. The surgeon used multiple interrupted sutures to close the eye after surgery.

The current standard of care uses no sutures in 99% of cases and if sutures are used, it is usually just one suture. Additionally, it is extremely rare that a patient is completely sedated for cataract surgery. Most cataract surgeries are done with a local anesthetic and the patient is awake throughout the entire procedure.*

It’s not easy to get all the vital nutrients you need to take care of your eyes from food alone. Fortunately, MacuGuard® Ocular Support with Astaxanthin contains the nutritional building blocks necessary to maintain the structural integrity of your eyes.

MacuGuard® Ocular Support with Astaxanthin maintains eye health in many ways:1-7

- Supports lutein concentration in the eye
- Supports efficient absorption of lutein in the bloodstream
- Provides phospholipids to enhance lutein in the cell membrane
- Maintains zeaxanthin concentrations in the eye
- Provides meso-zeaxanthin, which is difficult to obtain from dietary sources
- Contains cyanidin-3-glucoside, shown to help with night vision.
- Provides astaxanthin to protect against free radical-induced DNA damage, which may play a protective role against eye fatigue.

References:

Contains soybeans.
LuteinPlus® and Mz® are registered trademarks of Nutriproducts Ltd., UK, licensed under U.S. Patent 8,623,428.
The health benefits of eating cold-water fish are robust, yet concerns remain about contaminants found in wild and farm-raised fish.

This should not stop consumers from including fish in their diet, as the longevity advantages of consuming cold-water fish instead of foods like beef are substantial.

A recent study found that even vegetarians that include some fish in their diet fare better than strict vegetarians.¹

Eliminate Virtually All Fish-Derived Toxins

Consumers can exert significant control over their exposure to fish-borne toxins.

High-quality fish oil is distilled to remove synthetic and natural contaminants that existed in the fish itself. Enhanced molecular distillation techniques utilize redundant processes to virtually eliminate detectable environmental toxins.

The other safety concern about fish oil is that its delicate omega-3 fats are highly vulnerable to rancidity. No one wants to ingest oxidized (rancid) oils.

A new fish oil blend derived from pristine waters off the coast of Alaska utilizes a multistep process to remain exceptionally fresh. The result is that this Alaskan-derived fish oil has a greater than 5-fold reduction in the upper level threshold measurement for oxidation.

Current oxidation standards for quality fish oils ensure products free from rancidity. The new Alaskan-derived fish oil specification advances this premium standard 5-fold better!

The chart below reveals the reduction in upper limit for oxidation of this new Alaskan fish oil blend over existing quality fish oils:

<table>
<thead>
<tr>
<th></th>
<th>Alaskan-Derived Specification</th>
<th>Current High-Quality Specification</th>
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</thead>
<tbody>
<tr>
<td>TOTOX (total oxidation value) (Lower means less oxidation)</td>
<td>Maximum: 5</td>
<td>Maximum: 26</td>
</tr>
<tr>
<td>PEROXIDE LEVEL (Measure of current oxidation)</td>
<td>Max: 1.0 meq/kg</td>
<td>Max: 5.0 meq/kg</td>
</tr>
<tr>
<td>ANISIDINE LEVEL (Measure of past oxidation and measure of aldehyde production during handling and storage)</td>
<td>Maximum: 5</td>
<td>Maximum: 20</td>
</tr>
</tbody>
</table>

Higher Percentages Of EPA And DHA

An advantage to higher EPA and DHA fish oil concentrations is smaller sized omega-3 capsules.

The addition of this new Alaskan-derived fish oil to the Super Omega-3 supplement group enables the same high-potency EPA/DHA to fit into slightly smaller softgels for easier swallowing.

International Fish Oil Association “Five-Star Rating”

The International Fish Oil Association (IFOS) is an independent organization that tests fish oils to determine their overall safety and quality. A Five-Star Rating indicates fish oils have been tested to meet very strict standards of quality as determined by EPA and DHA content, and for purity to rule out contamination with heavy metals, radiation, oxidation, and organic pollutants such as PCBs and dioxin.

The new Alaskan-derived fish oil enjoys the same Five-Star Rating mandated for all fish oils contained in the Super Omega-3 family of supplements.

Sustainable Fishing

The Marine Stewardship Council is an independent nonprofit organization that sets a standard for sustainable fishing so that fishing can continue indefinitely with minimal environmental impact.

The new Alaskan-derived fish oil is the first refined omega-3 concentrate available worldwide that carries the prestigious seafood sustainability certification from the Marine Stewardship Council.
Most Advanced Omega-3 Dietary Supplement

From supporting heart health and brain function to balancing the inflammatory response, there is no debating the broad-spectrum benefits of omega-3 fatty acids.\textsuperscript{2-4}

There are hundreds of fish oil supplements on the market. Only one incorporates lifesaving findings to provide omega-3 and olive fruit extracts, along with sesame lignans, in a family of formulas called Super Omega-3.

Fish Oil + Olive Fruit Extract = Greater Efficacy!

Research findings indicate that a combination of fish oil and olive oil can support a healthy inflammatory response better than fish oil alone.\textsuperscript{6} Super Omega-3 incorporates the benefits of both fish oil and olive fruit extract into a single novel formula. A four softgel serving supplies the equivalent polyphenol content of 8 to 12 tablespoons of extra virgin olive oil.

Sesame Lignans Enhance Fish Oil Efficacy

Studies show that when sesame lignans are added to fish oil, there is a greater safeguard against oxidation along with the EPA/DHA fatty acids being directed toward pathways that help with inflammatory reactions.\textsuperscript{6}

Benefits Of A Mediterranean Diet

The most popular Super Omega-3 formula provides the following potencies of Mediterranean health benefits in just four smaller softgel capsules:

<table>
<thead>
<tr>
<th>Four softgels contain:</th>
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<tbody>
<tr>
<td>Alaskan Wild Fish Oil Concentrate</td>
<td>4,000 mg</td>
</tr>
<tr>
<td>Omega-3s</td>
<td>2,400 mg</td>
</tr>
<tr>
<td>EPA</td>
<td>1,400 mg</td>
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<tr>
<td>DHA</td>
<td>1,000 mg</td>
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<tr>
<td>Polyphen-Oil™ Olive extract (fruit and leaf)</td>
<td>600 mg</td>
</tr>
<tr>
<td>Sesame seed lignan extract</td>
<td>20 mg</td>
</tr>
</tbody>
</table>

To order Super Omega-3, call 1-800-544-4440 or visit www.LifeExtension.com

Non-GMO

References
1. JAMA Intern Med. 2015;175(5):767-76.

Supportive but not conclusive research shows that consumption of EPA and DHA omega-3 fatty acids may reduce the risk of coronary heart disease.

These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease.
AGING FACIAL SKIN
Over time, the skin’s underlying support structure of collagen and elastin degenerates from repeated sun exposure. Combined with the effects of gravity, these factors rob facial skin of its youthful firmness and resilience.¹⁻³

Medical interventions to improve loose and sagging skin such as surgical face lifts are costly and associated with side effects.⁴⁻⁵ This leaves many people without a viable option.

You may not have to be one of them. Scientists have uncovered several new compounds that can turn the tide in your favor—providing a safe and effective alternative to current treatments.

This article will describe how an innovative peptide and three plant stem cell extracts work together to stimulate new production of collagen and elastin in aging skin, while protecting existing collagen and elastin against damaging ultraviolet radiation (UV). This novel strategy results in visibly firmer, more defined, younger-looking facial skin.
Collagen And Elastin: The Dynamic Duo

The physical appearance of your skin largely depends on the condition of the extracellular matrix that lies between cells in the dermis. In younger skin, the extracellular matrix is a highly organized structure rich in collagen and elastin proteins that work in tandem to maintain firmness and resilience.8,9

Collagen types I and III comprise most of the extracellular matrix, forming rope-like fibers that supply high-tensile strength and resist stretching.6,7 A different type of collagen—type IV—is a major component of the basement membrane that connects the dermis to the epidermis, where it self-assembles into a scaffolding network to provide mechanical stability.1

Elastin, on the other hand, accounts for the impressive ability of skin to stretch and recoil, allowing it to return to its original shape after facial expressions such as smiling, laughing, and squinting. Although elastin makes up only a small percentage of the total dry weight of the dermis, it is equally as important as collagen in supporting the appearance of youthful skin.9,10

As we age, however, elastin and collagen fibers decrease as a result of reduced synthesis,11,12 as well as increased degradation from UV-induced matrix metalloproteinases which are enzymes that destroy our skin’s support structure.1,3,14 Combined with the force of gravity, these age-related changes translate into loose and saggy facial skin with fine lines and wrinkles.15

Since surgical face lifts, injections, and laser treatments are expensive, uncomfortable, and often accompanied by side effects,14,15 researchers have been investigating compounds that could lift and tighten loose skin without these notable drawbacks.

Let’s take a look at how a unique peptide regenerates collagen and elastin to deliver remarkable skin tightening effects.

Acetyl Tetrapeptide-2 Creates New Collagen And Elastin

Aware of the fact that collagen and elastin molecules are too large in molecular weight to significantly penetrate the skin,16 scientists designed a low-molecular weight peptide called acetyl tetrapeptide-2 to overcome this problem.17

When scientists treated dermal fibroblasts with acetyl tetrapeptide-2, they observed a 47% increase in type I collagen synthesis.17 In addition, it was shown to favorably modulate gene expression of collagen types I and IV to improve skin cohesion and resistance.17

Elastin is made from its precursor molecule tropoelastin, which forms elastic fibers after key steps involving the enzyme lysyl oxidase-like 1 (LOXL1) and glycoprotein fibulin-5 (FBLN5).18-20 Both of these compounds decline with advancing age and consequently interfere with the proper formation of elastic fibers that give skin its elasticity.21,22

Acetyl tetrapeptide-2 has not only been shown to increase the synthesis of elastin by 22%, but also encouraged its formation into functional fibers by raising LOXL1 and FBLN5 1.7 fold and 2.3 fold, respectively.17

Additional research shows that acetyl tetrapeptide-2 further supports skin firmness and elasticity by producing adhesion molecules that strengthen the attachment of cells to the extracellular matrix.17

To determine its effectiveness in humans, researchers conducted a clinical trial involving a group of mature women suffering from saggy facial skin. After eight weeks of twice daily applications of acetyl tetrapeptide-2 to the targeted region, participants had average reductions of 9.5% in indentation and 23.2% in a skin flaccidity area parameter—leaving them with noticeably tighter and smoother facial skin.17

Next, we’ll examine plant secondary metabolites and their protective role against sun damage that damages elastin and collagen in the first place.

Targeting Plant Secondary Metabolites

Have you ever wondered why some plants have astonishing life spans? The answer lies in the remarkable regenerative capacity of meristematic cells located in the tips of plant roots and shoots.23,24 These plant stem cells, like human stem cells, can self-renew or differentiate into any other type of cell with a specific function based on the surrounding environment.25

For instance, meristematic cells give rise to secondary metabolites as part of the plant’s survival strategy under stress conditions imposed by living microorganisms (biotic stress) or the physical environment (abiotic stress).26,27 Although once believed to be useless waste products, secondary metabolites have now been shown to demonstrate potent, anti-inflammatory and anti-microbial properties—all of which shield the skin against its external enemies.28,29

Scientists quickly turned to plant cell culture as a means to access secondary metabolites, but early research was unsuccessful.30 After going back to the drawing board, scientists soon discovered a novel way to target secondary metabolites. By co-culturing plant stem cells with microorganisms (like bacteria), biotic stress is created that promotes the formation of secondary metabolites.31-33 More importantly, this approach yields sufficient quantities of these high-value compounds.
Plant Stem Cell Extracts And Their Secondary Metabolites

Researchers have identified three plants around the world—Açaí palm, Quercus alba, and Perilla frutescens—shown to adapt and resist harsh environmental conditions, from droughts to intense UV radiation. To stimulate production of the compounds responsible for this longevity, cells of each plant were extracted and then co-cultured with bacteria. This resulted in the following plant stem cell extracts, each of which provide a specific secondary metabolite:

1. **Euterpe oleracea fruit** extract (Cabbage Palm Fruit of the açaí palm family)—ferulic acid
2. **Perilla frutescens** extract—rosmarinic acid
3. **Quercus alba bark** extract—tannic acid

Lift And Tighten Aging Skin

- As we age, the skin’s underlying structural support of collagen and elastin breaks down from repeated sun exposure, and combined with the effects of gravity, make loose and sagging facial skin almost an inevitable part of aging.
- Researchers have identified several new compounds that provide a safe and effective alternative to current treatments with high cost and substantial side effects.
- Acetyl tetrapeptide-2 enhances skin cohesion and firmness in humans by triggering new production of collagen and elastin in aging skin.
- Three plant stem cell extracts and their secondary metabolites reduce damage to existing collagen and elastin fibers from UV rays through multiple mechanisms including decreasing interleukin-6 synthesis and boosting ATP production.
- Human studies show their ability to increase water content in aging cells, with *Euterpe oleracea* fruit extract improving moisture by 51% within 24 hours of topical application.
- Taken together, these four compounds create visibly firmer, more defined, younger-looking skin.

The skin’s loss of firmness and flexibility can be traced back to unprotected sun exposure. Plant stem cell extracts and their respective secondary metabolites have been demonstrated in laboratory studies to reduce damage to existing collagen and elastin fibers from ultraviolet radiation in several ways:

- Plant stem cell extracts modulate pro-inflammatory cytokine production following exposure to ultraviolet radiation. For instance, these stem cell extracts decrease the synthesis of a damaging cytokine called interleukin-6 (IL-6). As people age, IL-6 levels increase, which triggers the release of matrix metalloproteinase enzymes that degrade collagen and elastin.
• They suppress UV-induced free radicals—evident by their high oxygen radical absorbance capacity (ORAC) scores\textsuperscript{31-33} that contribute to oxidative stress involved in the destructive cross-linking of healthy collagen and elastin fibers.\textsuperscript{36} This process renders both proteins dysfunctional, leading to loose and inflexible skin.

• By inhibiting free radical generation, plant stem cell extracts protect vulnerable DNA and preserve the natural order for regenerating new collagen and elastin.\textsuperscript{31,37}

• Ultraviolet radiation alters mitochondrial energy production in dermal fibroblasts, resulting in less energy in the form of adenosine triphosphate (ATP).\textsuperscript{38} This slows down cellular activities that maintain firm and smooth skin. By ramping up ATP production, plant stem cell extracts replenish energy levels to improve cellular metabolism, promote new collagen and elastin, and boost DNA repair.\textsuperscript{31-33}

Human studies using the same three plant extracts confirm their ability to increase water content in aging cells, keeping them plump to give the appearance of firmer and smoother skin.\textsuperscript{31-33} In one of these human studies, Euterpe oleracea fruit extract improved moisture by \textit{51\% within 24 hours} and \textit{102\%} after four weeks compared to a control, thereby demonstrating its immediate and long-lasting hydrating effects.\textsuperscript{31}

\section*{Summary}

While wrinkles and fine lines have been treated successfully with topical solutions, improving loose and sagging skin so far has been a losing battle. One primary reason is that medical interventions are costly, uncomfortable, and often accompanied by side effects.

Fortunately, scientists have identified new compounds that provide a safe and effective alternative to current treatments.

\textbf{Acetyl tetrapeptide-2} enhances skin cohesion and firmness by triggering new production of collagen and elastin, while three plant stem cell extracts and their respective secondary metabolites work to protect existing collagen and elastin fibers from damaging UV rays.

This novel strategy results in visibly firmer, more defined, younger-looking facial skin.

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

\section*{References}


By the time men turn 40, one of the most important health factors they must monitor is the condition of their prostate. Researchers have uncovered data revealing that zinc plays an active role in maintaining prostate health and that optimal zinc intake is an essential factor in preventing the unhealthy cell division in prostate cells.

Numerous carefully designed studies show zinc provides aging men considerable protection of the prostate. For example, zinc:

- Repairs DNA damage
- Supports normal cell division in the prostate
- Reduces expression of pro-inflammatory cytokines
- Promotes normal cell life cycle

In addition to prostate health, zinc also supports and maintains:

- A healthy inflammation response
- Insulin production
- Thyroid and bone production

Between 35-45% of people over age 60 don't get the daily recommended requirement. A longstanding problem is that zinc absorption can be limited by certain plants and grains, which contain a compound called phytate.

Life Extension® has developed a formulation combining the superior bioavailability of zinc monomethionine along with zinc citrate to provide a potent 50 mg dose of these absorbable forms of zinc in a single capsule.

References
Unprotected sun exposure and the passage of time deplete your skin’s firmness, hydration, and flexibility. A newly developed peptide—in conjunction with three plant stem-cell extracts—provides unique protection against these changes, breathing new life into aging and damaged skin.

**Acetyl Tetrapeptide-2**

The new Multi Stem Cell Skin Tightening Complex contains acetyl tetrapeptide-2. This low-molecular-weight peptide works at the cellular level to trigger new production of collagen and elastin.¹ Eight weeks of twice-daily applications of acetyl tetrapeptide-2 were shown to give facial skin a tighter and smoother appearance.¹

**Plant Stem-Cell Extracts**

To support this new collagen and elastin production, dermatologists blended three plant stem-cell extracts that support existing collagen and elastin against UV rays.²-⁴ These stem cells allow plants to resist harsh environmental conditions from droughts to UV radiation.²-⁴ Cabbage Palm Fruit Extract (*Euterpe oleracea*), White Oak Bark Extract (*Quercus alba*), and Perilla Extract (*Perilla frutescens*) were shown in human studies to boost water content in aging skin,²-⁴ which can result in a firmer and smoother appearance.

Just 1-2 drops of this formula, day and night, effectively target the underlying origins of the appearance of aging and damaged skin.

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To order Cosmesis Multi Stem Cell Skin Tightening Complex, call 1-800-544-4440 or visit www.LifeExtension.com

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**References**

The Microbiome Of Aging And Age-Related Disease Conference
The microbiome refers to the full complement of microbial organisms inhabiting the human body, including bacteria, protozoa, fungi, and viruses. There are about 10 times as many microbial cells as there are human cells in the body. The great majority of these organisms reside in the gut, particularly the colon. The human colon typically contains almost half a pound of bacteria, which function as if they were another human organ. There are many thousands of times more bacteria in the colon than there are in the small intestine, just as there are many thousands of times more bacteria in the small intestine than there are in the stomach. Beneficial effects of bacteria in the gut include displacement of harmful bacteria, synthesis of vitamins, degradation of fibrous foods, maintenance of intestinal wall integrity, and stimulation of the immune system.

Ingested food typically spends less than an hour in the stomach, where acidic conditions are very unfavorable to most microorganisms. Food being digested typically spends two to six hours in the small intestine where most absorption occurs. Thereafter, food remnants (mostly fiber) reach the large intestine (colon, large bowel), where they remain an average of about 40 hours for the many bacteria to ferment the fiber that cannot be digested in the small intestine. The sulfur component of gas resulting from fermentation gives an unpleasant odor to flatus and feces. Human feces composition is about three-quarters bacterial.

On October 16 to 19, 2014, what may have been the world’s first conference on the impact of the microbiome on aging was held near San Antonio, Texas. The conference was organized by the Barshop Institute, an organization dedicated to curing the diseases of aging. The Director of the Barshop Institute, Dr. Nicolas Musi, attended the sessions and gave a presentation.
The Human Microbiome Project

William Nierman, PhD, (Director, Infectious Disease Program, J. Craig Venter Institute, California) reported on some of the results of the Human Microbiome Project (HMP). The HMP was initiated in 2007 by the National Institutes of Health as a follow-up of the Human Genome Project. The mandate of the HMP was to sequence the genomes of microorganisms inhabiting five major body areas: gastrointestinal tract, oral cavity, skin, urogenital/vaginal, and respiratory tract. The J. Craig Venter Institute, where Dr. Nierman works, was one of the four research centers designated to do HMP genome sequencing.16

More than 99% of the microorganisms identified in the colon were bacteria from the Bacteroidetes and Firmicutes phyla of bacteria out of the dozens of possible bacterial phyla that exist.17 Aside from bacteria producing short-chained fatty acids from fiber, there were organisms converting the hydrogen gas produced by fermentation into methane.17

The skin offers a more harsh habitat for organisms than other areas of the body, which means fewer species of bacteria reside there.18 As in other areas of the body, some species of bacteria on the skin are protective by preventing overgrowth of harmful species.18 Oily areas of the skin can attract acne-causing bacterial strains,18,19 which can be treated with topical ginseng, pine, or black currant.18

Staphylococcus overgrowth on the skin is associated with atopic dermatitis (also called atopic eczema, “atopic” meaning hypersensitive), a condition that affects about 15% of American children.20 Atopic dermatitis is the most common inflammatory skin disease.21 Atopic dermatitis is associated with growing up in an excessively sanitary environment that is believed to counteract the development of a healthy immune system (ie, the hygiene hypothesis).22 One study found that children who received antibiotics early in life have a 40% increased risk of developing atopic dermatitis.23 Conversely, childhood exposure to furry pets or farm animals was associated with reduced risk (although this is partly because allergy-sensitive families will avoid having furry pets).24 Vitamin D supplementation has been shown to reduce atopic dermatitis.25 Paradoxically, mineral baths can be beneficial, whereas hard water may be harmful.25

George Weinstock, PhD, (Professor, Jackson Laboratory for Genomic Medicine, Maine) was a Principal Investigator of the Human Microbiome Project.26 In particular, Dr. Weinstock was Principal Investigator for studying the “human virome” (the cumulative genetic makeup of viruses inhabiting the human body).27 Although viruses can cause disease, the typical healthy human carries many persistent viruses that cause no harm, and may even be protective.27 Dr. Weinstock reported on the microbiome of the mouth and the vagina.

As with other areas of the body, studying the organisms that inhabit the oral cavity is difficult because the majority of them cannot be cultured in a laboratory.28 Oral bacteria are linked to a variety of diseases, including diabetes, stroke, pneumonia, and cardiovascular disease.28 A correlation has been found between bacteria in dental plaque and bacteria in atherosclerotic plaque.29 Dietary sugar increases acidity in the mouth, which encourages the growth of acid-producing (cavity-producing) bacteria.30

A healthy vagina is dominated by Lactobacillus bacteria that turn lactose and other sugars into lactic acid.31,32 In contrast to the mouth, a slightly acid environment is protective in the vagina because it suppresses the growth of harmful bacteria.33 Displacement of Lactobacilli by other classes of bacteria results in bacterial vaginosis, a condition that affects 8 to 23% of women of reproductive age. Symptoms include a vaginal discharge having a fishy odor, although about 40% of women do not have these symptoms.34 The condition is present in over 70% of sex workers, and is associated with sexually transmitted disease.35 Although irrigating the vagina (douching) is imagined to be hygienic, the practice increases the risk of bacterial vaginosis, so douching should be avoided.36

Chronic Inflammation And The Microbiome

Tyler Curiel, MD, (Professor of Medicine, University of Texas Health Sciences Center) is concerned with the effects of inflammation in the gut, which can lead to inflammatory bowel disease37 as well as cancer of the colon and rectum.38,39

Bacteria are generally classified as either gram-negative or gram-positive on the basis of whether they take a Gram stain. Gram-positive bacteria have a thick layer of peptidoglycan protecting the cell membrane, whereas gram-negative bacteria have an exposed cell membrane displaying lipopolysaccharide (LPS), a carbohydrate-fat complex.40,41 LPS is a potent inducer of inflammation,42 which is why it is called endotoxin. LPS causes intesti-
Butyrate reduces intestinal permeability and inflammation. Olive oil has been shown to protect mice against septic shock induced by LPS.

Dietary fiber in the colon is fermented to produce the short-chain fatty acids acetate, propionate, and butyrate. Acetate absorbed into the bloodstream from the colon is an energy source for muscle, heart, kidney, and brain. Butyrate mainly remains in the colon, where it is the major energy source for colon cells. In mice fed a high-fat diet, butyrate supplementation prevented obesity and insulin resistance. Human patients with inflammatory bowel disease have been effectively treated with butyrate enemas.

Dr. Curiel described a study showing that the short-chain fatty acid butyrate boosts anti-inflammatory action of the immune system. Butyrate leads to epigenetic changes in immune system cells (macrophages) that reduce the secretion of inflammatory factors (like IL-6). Butyrate reduces intestinal permeability and the infiltration of harmful molecules, like LPS, into the bloodstream from the colon. Butyrate given orally as a doubly enteric-coated tablet was an effective treatment for irritable bowel syndrome. Propionate and acetate also have anti-inflammatory effects.

Nicolas Musi, MD, (Director of the Barshop Institute, and Professor of Medicine at the University of Texas Health Center) discussed the role of dietary fat in inflammation, obesity, and aging. Both aging and obesity are characterized by chronic inflammation. The innate immune system reacts to lipopolysaccharide (LPS) in the cell membranes of gram-negative bacteria by an inflammatory response. As a defense against bacteria, this form of inflammation is protective in contrast to the chronic inflammation associated with obesity and aging. Chronic inflammation causes the muscle wasting (sarcopenia) so often seen with aging.

Toll-like receptors on immune system cells (macrophages) and fat cells are detectors that trigger inflammation in response to the fat (in LPS) in bacterial cell membranes. Unfortunately, these receptors also produce an inflammatory response to forms of fat other than what is found in bacterial cell membranes. Infusion of free fatty acids or LPS into mice has been shown to increase inflammation and, as a consequence, increases insulin resistance and obesity. Healthy men given a high-calorie diet showed increased plasma LPS. LPS in the bloodstream of type II diabetics was found to be about 75% higher than in healthy subjects.

An inflammatory effect is seen in healthy humans after eating a high-fat, high-carbohydrate meal—but not after eating a meal rich in fruit and fiber. Not all fat has this effect, however. In fact, supplementation with the omega-3 fatty acid eicosapentaenoic acid (EPA) has been shown to reduce inflammation and muscle wasting.

Claudio Franceschi, MD, (Professor of Immunology, University of Bologna, Italy) is best known for his concept of chronic inflammation as the cause of aging and aging-related disease (i.e., inflammation). The innate immune system recognizes peptidoglycan in the cell wall of gram-positive bacteria and lipopolysaccharide (LPS) in the cell membrane of gram-negative bacteria to produce an inflammatory response that fights the bacteria. LPS is more inflammatory than peptidoglycan. In a healthy immune system, the inflammation ceases after the bacteria have been eliminated, but aging results in an increasingly unhealthy immune system characterized by chronic inflammation. Mice fed a high-fat diet showed a higher proportion of gram-negative (LPS-containing) bacteria in their gut, greater intestinal wall permeability, and a higher concentration of LPS in their bloodstream. Excess body fat also causes chronic inflammation, leading to atherosclerosis, insulin resistance, high blood pressure, and other aging-related diseases.

Dr. Franceschi believes that an aging-related decline in short-chain fatty acids, especially butyrate, plays an important role in age-related chronic inflammation. Butyrate is the preferred energy source for cells lining the colon, and those cells produce mucin that protects the walls of the colon. When the colon cells do not get enough butyrate, the inflammatory bacterial components peptidoglycan and LPS continuously leak out of the colon into the blood stream, resulting in chronic inflammation.

The Microbiome In Model Organisms

Filipe Cabreiro, PhD, (Lecturer, University College, London, UK), like many researchers studying the microbiome, uses nematode worms and fruit flies as model organisms. Model organisms are used because their biology is known in great detail and can be easily manipulated, and because they have such short life spans. Nematodes rely upon their gut bacteria for nitric oxide, which enhances stress resistance and longevity.
Dr. Cabreiro has found that the antidiabetic drug metformin has effects apart from lowering blood sugar. Metformin activates the energy-sensing enzyme AMPK in both nematode worms and fruit flies, but extends the life span of nematodes, not fruit flies. Metformin alters bacterial metabolism in such a way as to restrict the amino acid methionine. Methionine restriction has also been shown to extend life span in rats. Dr. Cabreiro established that the effect of metformin on nematode life span is dependent upon the strain of bacteria in the worms. He suggested that the lack of a life span extension effect in fruit flies is due to different bacteria in the fruit flies.

Dr. Cabreiro also cited literature emphasizing the intimate relationship between humans and their microbiota. Germ-free mice exhibit numerous defects in the development of their immune systems. As the human immune system develops it learns to distinguish between self and non-self. At the same time, however, the human immune system learns that the microbiome is part of the self, which protects the microbiome from attack by the immune system. Specific bacteria have been shown to be important for the development of the human immune system.

*H. pylori* is one of the few bacteria that can tolerate the acidic conditions of the stomach. Although *H. pylori* can cause stomach ulcers, the bacterium has many beneficial effects, including regulation of stomach acid and stomach hormones controlling appetite. Although the great majority of Americans once had *H. pylori* in their stomach, now only a few percent do, as a result of overuse of antibiotics in childhood. The result has been an increase in obesity and acid reflux disease.

### Studying The Colon Microbiome

Paul O’Toole, PhD, (Professor, University College Cork, Ireland) has studied the difference between colon microbiota in the elderly compared to the microbiota in the colon of healthy adults living in Ireland. By phyla (major divisions of bacterial type), he found healthy adults to have 51% Firmicutes and 41% Bacteroidetes, whereas he found 40% Firmicutes and 57% Bacteroidetes in the elderly. Studies in different European countries show very different changes in bacteria phyla populations with aging. Differences in species below the phylum level may account for the seemingly contradictory results. Obese mice and humans show fewer Bacteroidetes than those who are lean. A mouse study showing greater weight gain with a high-saturated-fat diet than with a high-unsaturated-fat diet found that the saturated-fat-diet elevated the Firmicutes-to-Bacteroidetes ratio.

Dr. O’Toole found that institutionalized elderly had less bacterial diversity in their colon than non-institutionalized elderly, and this lack of microbial diversity correlated with frailty. Dr. O’Toole addressed the effect of high antibiotic use among the elderly and others. Antibiotics can be life-saving, but there can be negative side effects. A major function of some bacteria is to prevent overgrowth of harmful bacteria. Diarrhea resulting from antibiotic treatment is sometimes due to the bacterium *Clostridium difficile*. Further antibiotic treatment is often futile. For decades, stools from healthy patients have been inserted into the rectum of patients suffering from *C. difficile* overgrowth after antibiotic treatment. Recently, stools from lean donors have been shown to increase insulin sensitivity when transplanted into the colon of metabolic syndrome patients. Also recently, stool substitutes consisting of collections of known bacterial species ensured to be free of pathogenic microbes have been used with success.

Stephen O’Keefe, MD, (Professor, University of Pittsburg, Pennsylvania) is a specialist in inflammatory bowel diseases (ulcerative colitis and Crohn’s disease) and colorectal cancer. Crohn’s disease is not an autoimmune disease, but instead is a combined result of both genetics and intestinal bacteria. Inflammatory bowel disease leads to colorectal cancer in the range of about 8 to 18% of cases. According to the American Cancer Society, colorectal cancer is the third leading cause of cancer death in males and females in the United States: breast (female) and prostate (male) are first, lung/bronchial is second,
and colon/rectum is third. Although colon cancer is up to 25% more common among African Americans than Caucasian Americans, native Africans rarely get colon cancer.\textsuperscript{100} Bile acids, which are normally synthesized in the liver from cholesterol, function to emulsify fats in the intestine. But with a high-fat, low-fiber diet, certain colonic bacteria can lead to an increase in toxic secondary bile acids \textit{lithocholic acid} and \textit{deoxycholic acid}, which can increase colon cancer risk.\textsuperscript{101} Comparing colon fluid samples, Dr. O’Keefe’s team found that lithocholic acid was \textbf{3.3 times} higher in African Americans than in Africans, and deoxycholic acid was \textbf{5.1 times} higher.\textsuperscript{100}

\textit{Butyrate} is chemopreventive and inhibits the survival of colon cancer cells.\textsuperscript{102} Calcium in milk or supplements has been shown to precipitate toxic bile acids, and reduce the risk of colon cancer.\textsuperscript{103,104} Chlorogenic acid in coffee and blueberries can protect the colon from toxic bile acids.\textsuperscript{105} Conversely, dietary pro-inflammatory \textit{omega-6} fatty acids (found in many vegetable oils and prevalent in the Western diet) and vitamin D deficiency increase inflammation and risk of colon cancer.\textsuperscript{106}

In comparing the gut bacteria from rural African children with European children, Dr. O’Keefe’s team found much greater diversity in the bacteria of the Africans, and a relative absence of inflammatory bacteria.\textsuperscript{107} Much of the African bacteria were from the genus \textit{Prevotella}, whereas this genus was virtually absent in the Europeans. Aside from diet, Dr. O’Keefe attributed these differences to greater use of antibiotics and Caesarean section birth in Europe, as well as reduced breast feeding by Europeans.\textsuperscript{107} Short-term antibiotic treatment can alter microbiota for years.\textsuperscript{108}

When babies are born naturally, they acquire their first microbiota from their mother’s birth canal.\textsuperscript{109,110} When born by Caesarean section, their first bacterial exposure is generally from the mother’s skin.\textsuperscript{110} Caesarian birth has been associated with greater vulnerability to childhood asthma.\textsuperscript{111,112} Birth by Caesarian section has greatly increased in recent decades, currently accounting for nearly a third of births in the United States, 40% of births in China, and nearly half of births in Brazil.\textsuperscript{113} Although Caesarean section can be life-saving in specific situations, the American College of Obstetricians and Gynecologists recently expressed concern that Cesarean delivery is overused.\textsuperscript{114}

Breastfeeding provides an infant not only with microorganisms from the mother, but with growth factors, oligosaccharides, and more whey protein than is found in cow’s milk.\textsuperscript{115} The proportion of children who were ever breastfed is lower in the US than in many other countries.\textsuperscript{116} Compared to formula feeding, breastfed infants have less diarrhea, less inflammatory bowel disease, and possibly fewer food allergies.\textsuperscript{115,117} Oligosaccharides in breast milk reportedly contribute to brain development.\textsuperscript{118}

\section*{Good Diet For The Microbiome}

Maria Marco, PhD, (Assistant Professor, Food Science and Technology, University of California) described the benefits of a diet high in fiber and digestion-resistant starch. Foods such as potatoes, rice, pasta, bread, noodles, sugars, and breakfast cereals are rapidly digested, which rapidly increases blood sugar that stimulates insulin release. Blood sugar then quickly drops resulting in a repeating cycle of hunger and eating—leading to obesity, insulin resistance, and type II diabetes.

By contrast, split peas, lentils, black beans, artichokes, raspberries, rolled oats, and other foods high in fiber or resistant starch are very slowly digested and have important health benefits.\textsuperscript{119} Short-chain fatty acids (especially butyrate) produced in the colon by bacteria fermenting dietary fiber prevent inflammation and help prevent colon cancer.\textsuperscript{119} Mice fed digestion-resistant starch show better glucose tolerance and increased levels of hunger-reducing peptides.\textsuperscript{120,121} A human study showed similar benefits.\textsuperscript{122} Weight cycling (repeated loss and regaining of body weight) is associated with bone loss, an effect that can be minimized by a diet high in digestion-resistant starch.\textsuperscript{123}

\section*{Probiotics And Prebiotics}

Fiber and digestion-resistant starch are called \textbf{prebiotics}. Prebiotics are components of food that cannot be digested by the stomach or small intestine, but are fermented in the colon to provide additional nutrients and health benefits.\textsuperscript{124,125}
By contrast, probiotics are live bacteria that provide health benefits when taken orally. Probiotics able to survive the acidic environment of the stomach include acid-producing bacteria from the genus Lactobacillus and the genus Bifidobacterium. Escherichia coli and Streptococcus from the birth canal are predominantly the first bacteria in a newborn, but upon breastfeeding, these bacteria are mostly displaced by Bifidobacteria. Bifidobacteria can account for 95% of gut bacteria in healthy, breast-fed babies. The decline of Bifidobacteria with age may contribute to aging-associated disease.

Probiotics have been used in medicine to prevent or treat antibiotic-associated diarrhea. Probiotics given to mothers prenatally were shown to reduce the incidence of atopic eczema in their children by about half. Probiotics given to the elderly were shown to enhance immune system function. Prebiotics fed to mice increased longevity by suppressing chronic gastrointestinal disease.

Prebiotics are digestion-resistant chains (polymers, oligosaccharides) of sugar molecules. Such oligosaccharides occur naturally in chicory, asparagus, onions, soybeans, and milk. Prebiotics promote the growth of Bifidobacteria in the colon. Prebiotics have been shown to protect rats from colon cancer. In humans, prebiotics have been shown to reduce appetite, improve insulin sensitivity, and promote weight loss.

Fermentation of fiber produces gas, but this effect can be reduced for longer polymers (chains) of sugar molecules. Alpha-galactosidase (an enzyme that may be taken orally) has been shown to reduce the volume of gas resulting from fiber fermentation in the colon. Concern about flatulence from eating beans is reportedly based on an exaggerated perception of the effect, and ignores the health benefits. Mixing prebiotics can reduce gas. Dietary meat increases the unpleasant odor in gas resulting from sulfur compounds, which can cause DNA damage (increasing cancer risk).

Conclusion

Existing and new information about the importance of our microbiota suggests everyone should supplement with a high-quality probiotic on a daily basis. Considering the harm that can be caused to the microbiota by the use of antibiotics, it seems prudent to avoid antibiotics when possible and to supplement with probiotics following an antibiotic treatment cycle.

References


THE MICROBIOME OF AGING AND AGE-RELATED DISEASE CONFERENCE


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Studies document that people who eat the most **fruits** and **vegetables** have far fewer health problems. The dilemma is that most individuals do not consistently eat enough plant foods, and commercial multivitamins do not provide the vital plant components needed to maintain good health.1-3

**Life Extension Mix™** is vastly superior to commercial multivitamins because it provides a remarkably broad array of **fruit** and **vegetable extracts**. Packed into this blend are extracts of fruits ranging from grape and maqui to pomegranate and tart cherry. Its vegetable extracts range from olive to broccoli and artichoke.

Another reason to consider **Life Extension Mix™** is its exhaustive list of **water** and **fat-soluble vitamins, minerals, amino acids**, and more. It’s the only multivitamin to contain **nicotinamide riboside**, which supports mitochondrial health and promotes longevity pathways.

**Life Extension Mix™** is the most comprehensive, high-potency daily multivitamin anywhere.

When the original **Life Extension Mix™** was introduced in **1983**, people lined up to purchase it because it provided the most efficient way to affordably obtain a broad-array of beneficial nutrients.

Since its introduction 32 years ago, the **Life Extension Mix™** formula has been upgraded **dozens of times** to reflect new findings in the scientific literature.

**Life Extension Mix™** has always been a bargain because the cost of taking the individual nutrients separately would be much **higher** than its retail price. We are pleased to announce that the price of **Life Extension Mix™** has been reduced by up to **21%**.

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(Turn this page to review the entire Life Extension Mix™ formula.)

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**References:**

Contains soybeans. Contains fish (Tilapia).
Scientists have identified multiple mechanisms by which green tea extract helps protect against LDL oxidation, neuronal oxidation, and a host of other structural and functional age-related changes. LIFE EXTENSION MIX™ provides more green tea extract than found in commercial formulations.

**Broccoli** is one of the vegetables best documented to protect healthy DNA. The broccoli concentrate in LIFE EXTENSION MIX™ is standardized to provide sulforaphane and other glucosinolates, compounds responsible for broccoli’s protective benefits.

**Olive polyphenols** help protect against LDL oxidation, quench free radicals, and stabilize cell membranes. LIFE EXTENSION MIX™ contains an olive extract standardized to provide the best-documented polyphenol called hydroxytyrosol.

**Luteolin** is a flavonoid found in parsley, artichoke, basil, celery, and other foods. It has shown the ability to help protect against DNA oxidative damage. When measured against 27 other citrus flavonoids, luteolin proved one of the most beneficial at maintaining healthy DNA. Luteolin also suppresses excess levels of interleukin-6 and interleukin-1b. LIFE EXTENSION MIX™ contains a standardized dose of 8 mg of luteolin.

**Lycopene** is the red carotenoid in tomatoes that supports a healthy prostate and helps promote healthy lipid profiles for those already within a normal range.

**Lutein** is found in spinach and collard greens and has been shown to help maintain eye macula pigment structure.

**Pomegranate** may be the most effective plant to help maintain optimal endothelial function. This pomegranate extract is standardized to provide the punicalagins and other polyphenols found in up to 2.6 ounces of pomegranate juice.

**Sesame lignans** increase tissue levels of vitamin E, including gamma tocopherol, and inhibit the formation of an inflammatory precursor called arachidonic acid.

**Wild blueberry extract**, standardized to help maintain optimal neuronal function.

**Bilberry** extracts have antioxidative properties that not only are neuroprotective, but they also help suppress photooxidative processes and have been shown to improve microcapillary circulation.

**Cyanidin-3-Glucoside** is a berry compound that promotes healthy function of the retina to help support night vision.

**Pterostilbene** is a compound naturally found in blueberries and grapes that has been shown to have beneficial, anti-aging effects on gene expression and to promote healthy cognitive function.

**D-glucarate** is found in grapefruit, apples, oranges, broccoli, and Brussels sprouts. D-glucarate supports a detoxification process that helps to remove DNA toxins.

**Delphinidins** are potent anthocyanins found in maqui berries that activate production of nitric oxide, enabling vascular relaxation and supporting blood pressure. They can also help control inflammatory processes, stimulate the immune system, and stabilize blood sugar.

**Vegetable-Fruit Complex**

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decaffeinated Green tea extract (45% EGCG)</td>
<td>325 mg</td>
</tr>
<tr>
<td>Broccoli sprout concentrate extracts and calcium D-glucarate</td>
<td>725 mg</td>
</tr>
<tr>
<td>Olive juice extract (providing polyphenols, hydroxytyrosol, tyrosol, oleuropein)</td>
<td>12.5 mg</td>
</tr>
<tr>
<td>Grape seed proanthocyanidin extract (Leucoselect®)</td>
<td>25 mg</td>
</tr>
<tr>
<td>Grape (proanthocyanidin) extract (BioVin®)</td>
<td>25 mg</td>
</tr>
<tr>
<td>Luteolin (from orange extract)</td>
<td>8 mg</td>
</tr>
<tr>
<td>Lycopene (natural tomato extract) (Tomat-O-Red®)</td>
<td>3 mg</td>
</tr>
<tr>
<td>Lutein (marigold extract)</td>
<td>15 mg</td>
</tr>
<tr>
<td>(465 mcg trans-zeaxanthin)</td>
<td></td>
</tr>
<tr>
<td>Maqui Berry (Aristotelia chilensis) anthocyanin extract</td>
<td>100 mg</td>
</tr>
<tr>
<td>Milk thistle extract (85% silymarin)</td>
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<tr>
<td>Bromelain (from pineapple)</td>
<td>15 mg</td>
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<tr>
<td>Citrus Bioflavonoids (50% hesperidin)</td>
<td>200 mg</td>
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<tr>
<td>Acorola extract 4:1</td>
<td>300 mg</td>
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<tr>
<td>Bilberry extract (MirtoSelect®)</td>
<td>30 mg</td>
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<tr>
<td>Pomegranate extract (30% punicalagins) (POMELLA®)</td>
<td>85 mg</td>
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<tr>
<td>Sesame seed lignan extract</td>
<td>10 mg</td>
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<tr>
<td>Fruit/Berry Complex blend</td>
<td>200 mg</td>
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<tr>
<td>(proprietary blend of concentrated blackberry, blueberry, cherry, cranberry, elderberry, persimmon, prune powders)</td>
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</tr>
<tr>
<td>Wild Blueberry anthocyanin extract (fruit)</td>
<td>150 mg</td>
</tr>
<tr>
<td>trans-Pterostilbene (from pTeroPure™)</td>
<td>0.5 mg</td>
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<tr>
<td>Cyanidin-3-Glucoside (C3G) (from blackcurrant extract)</td>
<td>1.25 mg</td>
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<tr>
<td>CherryPure® Tart Cherry (Prunus cerasus) proanthocyanidin extract</td>
<td>85 mg</td>
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<tr>
<td>Delphinidins (from Delphinol® Maqui berry (Aristotelia chilensis) extract)</td>
<td>2 mg</td>
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**Water-Soluble Vitamins and Enzymatic Activators**

<table>
<thead>
<tr>
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<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitamin C</td>
<td>2000 mg</td>
</tr>
<tr>
<td>as: ascorbic acid, calcium, magnesium &amp; niacinamide ascorbates, ascorbyl palmitate, acerola extract</td>
<td></td>
</tr>
<tr>
<td>Natural Folate (from lemon extract)</td>
<td>400 mcg</td>
</tr>
<tr>
<td>Biotin</td>
<td>3,000 mcg</td>
</tr>
<tr>
<td>Trimethylglycine (TMG)</td>
<td>100 mg</td>
</tr>
<tr>
<td>Vitamin B1 (thiamine HCl)</td>
<td>125 mg</td>
</tr>
<tr>
<td>Vitamin B2 (riboflavin)</td>
<td>50 mg</td>
</tr>
<tr>
<td>Supplying: Riboflavin 5'-phosphate</td>
<td>2 mg</td>
</tr>
<tr>
<td>Vitamin B3 (niacinamide and niacinamide ascorbate)</td>
<td>117 mg</td>
</tr>
<tr>
<td>Vitamin B3 (niacin)</td>
<td>73 mg</td>
</tr>
<tr>
<td>Vitamin B5 (D-calcium pantothenate)</td>
<td>600 mg</td>
</tr>
<tr>
<td>Vitamin B6 (pyridoxine HCl)</td>
<td>5 mg</td>
</tr>
<tr>
<td>Pyridoxal 5'-phosphate (vitamin B6)</td>
<td>100 mg</td>
</tr>
<tr>
<td>Vitamin B12 (methylcobalamin)</td>
<td>600 mcg</td>
</tr>
<tr>
<td>Nicotinamide Riboside (NIAGEN®)</td>
<td>2 mg</td>
</tr>
</tbody>
</table>

These statements have not been evaluated by the Food and Drug Administration. These products are not intended to diagnose, treat, cure, or prevent any disease.
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Fat-Soluble Vitamins

Vitamin A (as Betatene® natural beta-carotene from dunaliella and acetate) 5,000 IU
Vitamin D3 (cholecalciferol) 2,000 IU
Vitamin C (as calcium ascorbate, ascorbic acid, ascorbyl palmitate, magnesium ascorbate, niacinamide ascorbate, acerola extract) 2,000 mg
Vitamin E (natural ¿-alpha tocopheryl succinate and ¿-alpha tocopherol) 100 IU
Natural mixed tocopherols (providing gamma, delta, alpha, and beta tocopherol) 60 mg

Amino Acid Complex

N-acetyl-L-cysteine 600 mg
Taurine 200 mg

Mineral Complex

Selenium (from Se-methyl L-selenocysteine) 100 mcg
Selenium (from L-selenomethionine—SelenoPure™) 50 mcg
Selenium (from sodium selenite) 50 mcg
Zinc (as zinc citrate) 20 mg
Zinc (monomethionine) (OptiZinc®) 15 mg
Boron (Alibon® bororganic glycine) 3 mg
Calcium 218 mg
Copper (as copper bisglycinate chelate TRAACS®) 1 mg
Chromium (as Crinomex 3+ chromium stabilized with Capros® and PrimaVie® Shilajit) 500 mcg
Potassium chloride (37.4 mg elemental) 71.3 mg
Molybdenum (sodium molybdate) 125 mcg
Manganese (gluconate) 1 mg
Iodine (potassium iodide) 150 mcg
Magnesium oxide (335.96 mg elemental) 560 mg
Magnesium citrate (35.28 mg elemental) 261.3 mg
Magnesium glycinate (11.74 mg elemental) 100 mg
Magnesium taurinate (7.83 mg elemental) 100 mg
Magnesium arginate (5.87 mg elemental) 100 mg
Magnesium ascorbate (3.40 mg elemental) 58.1 mg

Cholinergic Complex

Choline (from bitartrate) 120 mg
Phosphatidylcholine (from soy) 150 mg
Inositol 250 mg

Fatty Acid Nutrition

Medium-chain triglycerides 80 mg

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Vitamin D3 helps maintain healthy bone density and DNA. There is five times more vitamin D in LIFE EXTENSION MIX™ compared to conventional multivitamins.

The Life Extension Mix™ utilizes natural mixed tocopherols that provide natural vitamin E from alpha tocopherol and a small amount of gamma tocopherol (40 mg). Compared to synthetic vitamin E, the natural form is far more bioavailable to the body.

N-acetyl-L-cysteine suppresses free radicals inside the cell and maintains healthy glutathione levels. Taurine may protect against free radicals between cells and supports eye health.

Life Extension Mix™ contains the sodium selenite, selenomethionine, and Se-methyl L-selenocysteine forms of selenium. Some scientific evidence suggests that consumption of selenium may reduce the risk of certain forms of cancer; however, the FDA has determined that this evidence is limited and not conclusive.

Zinc is often poorly absorbed, but LIFE EXTENSION MIX™ provides two of the most bioavailable forms of zinc.

Boron is not only needed to maintain healthy bone density but may also help promote healthy prostate cell function.

LIFE EXTENSION MIX™ provides a high amount of an optimal form of chromium to help maintain arterial wall structure and already normal glucose levels.

Magnesium helps protect arteries and heart valves, and supports heart and brain cells. LIFE EXTENSION MIX™ provides high potencies of six different forms of magnesium to fully saturate the body with this life-saving mineral.

Maintaining high levels of acetylcholine in the brain helps support cognitive function and memory.

A healthy type of dietary fat, medium-chain triglycerides are easily absorbed intact and transported directly to the liver, where they are immediately used for energy.

Contains soybeans. Contains fish (Tilapia).

References

To order, call toll-free 1-800-544-4440 or visit www.LifeExtension.com

These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease.
Scientists are increasingly discovering that probiotics impact the health of our entire body. Unfortunately, most commercial probiotics are destroyed by the stomach's natural digestive acids before they reach their destination.

FlorAssist® Probiotic Liquid Vegetarian Capsules with “dual encapsulation” technology delivers maximum probiotic protection to your small intestines.

FlorAssist® Probiotic Liquid Vegetarian Capsules:
- Contain probiotic strains that are stomach acid resistant
- Have dual encapsulation technology, which keeps the capsule intact longer and ensures that the probiotic reaches the small intestine
- Provide 15 billion CFU—Colony Forming Units—per capsule
- Contain 6 varieties of beneficial bacteria

FlorAssist™ contains the following bacterial strains:
1. Lactobacillus acidophilus LA-14
2. Lactobacillus rhamnosus LR-32
3. Lactobacillus paracasei LPC-37
4. Bifidobacterium longum BL-05
5. Bifidobacterium lactis BL-04
6. Bifidobacterium bifidum/lactis BB-02

These potent strains of probiotic bacteria adhere to the soft lining of the intestinal tract and help maintain a healthy surface and aid in support for the digestive system.

References
Dr. Vladimir Turovskiy
At The Forefront
Of Integrative Medicine

From the rigors of the Russian Army to the splendor of the Turnberry Isle Miami resort, Dr. Vladimir Turovskiy has evolved into one of South Florida’s foremost integrative medicine physicians, blending acupuncture, supplementation, lifestyle changes, and other therapies to treat patients of all ages.

“I call it the four Is—intensive, inclusive, individual, and involved,” says Turovskiy, whose Center for Integrative Medicine has two offices in Aventura, Florida, including one in the Turnberry Isle Miami Spa and Fitness center, and a third location in North Miami Beach. “Treatments, whether traditional or nontraditional, are put together inclusively to create an individual plan for each patient, whether that person is here for thyroid and hormone imbalances, chronic pain, obesity, or whatever the case may be.”

He also treats headaches, anxiety and depression, insomnia, allergies, arthritis, neurological issues, and many other conditions.

“We want the treatment plan to be intense so that it delivers the greatest possible results in the shortest amount of time,” he says. “From day one when a patient comes in, they’re involved in every decision surrounding their treatment based on time, financial preferences, and medical recommendations. They also have to be involved by actively participating in their own care, which includes daily dietary and lifestyle adjustments that I refer to as ‘homework.’ That’s integrative medicine to me, and it’s what I’ve been doing for more than 20 years.”
Turovskiy’s Training

Turovskiy moved to the United States in 1993 after serving in the military and later working as a sports therapist and rehabilitation specialist for Russian ballet dancers and elite athletes. He attended medical school in Moscow and studied Oriental medicine, including acupuncture, herbs, and massage, in Florida.

“Training in the Soviet Union created a uniformity because if you had anything to do with health—acupuncture, chiropractor, massage, nursing, physical therapy, and so on—you went to medical school. Anyone other than a doctor studied at a junior level, but everyone started with the same training and then specialized later, so it qualified you to work alongside other practitioners for the best interest of the patient.

“Once a day we would meet for about an hour—everyone in the hospital from the surgeon to the acupuncturist to the massage therapist—and share how each patient’s treatment was progressing,” he says, recalling his time at the Central Institute of Trauma and Orthopedics in Moscow. “We’d discuss what was working and what needed to change for the patient to get the best outcome.”

That teamwork is what taught him to incorporate a variety of treatments into his current practice, ranging from supplements that boost stress tolerance to cold laser therapy that activates the body’s anti-inflammatory response.

A Successful Outcome

Successful outcomes are achieved and maintained when a doctor doesn’t stop at treating just one symptom, Turovskiy says, referring to a recent case of a woman in her 70s who initially sought acupuncture treatment for pain.

“This is a perfect example of integrative medicine. She came in for one thing, and then said, ‘Oh, by the way, I want to talk to you about another problem. I’ve been depressed for the past year and a half. I feel very down and I just don’t feel like doing anything.’

“In addition to recommending an amino acid called L-tryptophan, which improves sleep and mood, I sent her for extensive bloodwork, and sure enough, her thyroid was off. It’s a pretty typical story because her doctor had said her tests were normal and that she was fine, but there’s more than just one measurement when evaluating the thyroid.”

The patient used Life Extension® supplements to boost L-tryptophan (mood) and iodine (thyroid function), along with acupuncture and exercise to elevate mood and manage other symptoms.

“After about three months, she was back to being her cheerful, productive self,” the doctor says. “She continues to follow these recommendations and come in for acupuncture for support. This is what the Center for Integrative Health practitioner, who takes vitamin D, a probiotic, turmeric, and omega-3 fatty acids, recommends these seven supplements as a starting point for most people:

• Food concentrate supplement containing greens and berries.
• Mineral supplements, including magnesium, zinc, and calcium.
• Probiotic to improve intestinal health.
• Vitamin D (even in regions with a sunny climate).
• Omega-3 fatty acids.
• Adaptogenic herbs, such as rhodiola, to help the body withstand stress.
• Collagen to support and repair connective tissue.

Dr. Vladimir Turovskiy’s Supplement Recommendations

The integrative health practitioner, who takes vitamin D, a probiotic, turmeric, and omega-3 fatty acids, recommends these seven supplements as a starting point for most people:
Turovskiy adds that he often shares his mother’s story with patients who want a quick fix. “If I told patients that I could cure cancer with acupuncture, but that it was going to take three years, I probably could close my doors,” he says jokingly. “Most people who come here want instant gratification, but then they’ll take a prescription drug forever. I try to help them see that the body is an incredible machine that can heal itself from within if we properly feed and support it, but it doesn’t happen overnight. It takes guidance from the doctor and commitment from the patient.”

In addition to traditional acupuncture, Turovskiy offers treatments with a microcurrent stimulator, a needle-free option that uses electrical conductivity on acupuncture points. “It’s a very unique approach, and many patients like the technology because they can look at graphics on the computer screen and see exactly where their electrical imbalances are,” he says, adding that acupuncture works well not only for pain but also for stress, smoking cessation, appetite control, and sexual dysfunction. “Acupuncture isn’t about needles. It’s about the proper selection of points on the skin and the movement of energy. Symptoms are always the result of an internal imbalance, a disruption in the life force, the energy. Acupuncture is the backbone of almost all of my treatments.”

Accepting Alternative Treatments

Tammy Pahel, spa director at Turnberry Isle Miami, says the increased acceptance of alternative therapies make Turovskiy’s practice a perfect fit for the resort, which serves nearly a thousand members and also is open to the public. “We’re trying to get the word out to the community and beyond—we have guests from around the world—that we offer a warm, relaxing environment, not a medical one, and having the Center for Integrative Medicine here means you can do much more towards improving your health than just getting a massage or facial.”

Turovskiy, who views health care as more of a passion than a profession, says his goal is to be an overall wellness partner, which can’t be achieved in today’s typical 10-minute office visit with a conventional doctor. “I do a lot of coaching and consulting on nutrition and supplements, and I take the time to get to know my patients and ask questions that may reveal an unexpected reason for their symptoms,” he says. “I want to not only treat those symptoms but also help people live longer; happier, more productive lives. The best way to do that is to support the body’s natural ability to heal from within.”

Inspired By His Mother’s Illness

Turovskiy, who exercises six days a week running, doing calisthenics, or lifting weights, has been using and recommending Life Extension supplements for 15 years. “Quality is the main reason why I use Life Extension,” he says. “I feel that the company holds itself to a higher standard because it sells directly not only to consumers but also to health care providers. There’s feedback from both sides. I also know what to expect, as far as results, because of the extensive research that’s involved.”

The youngest son of a scientist and schoolteacher, Turovskiy, 47, was inspired to become an integrative medicine practitioner—and especially eager to learn acupuncture—after seeing his mother get help for a neurological condition that conventional medicine failed to treat. “My mom had severe attacks of dizziness, and it was traumatic for me as a child because I never knew if she would come home or if the paramedics would have to respond,” he says. “After about a month in the hospital, they told her there was nothing more they could do, so they said, ‘There’s some crazy doctor here who does something on the side with needles, so maybe she can help you. Good luck.’ She had acupuncture treatment on and off for about three years, and it resolved many of her symptoms. I was impressed and wanted to learn to do it myself.”

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

For more information about Dr. Vladimir Turovskiy and the Center for Integrative Medicine, call 1-305-466-1977 or visit floridaintegrativemedicine.com.

For information on Turnberry Isle Spa, located at 19999 W. Country Club Dr. Miami, FL, visit turnberrysilemiiami.com/spa-and-fitness/ or call 1-305-933-6930.
Blood testing provides the ultimate information regarding correctable risk factors that may predispose you to disorders such as cancer, diabetes, cardiovascular disease, and more. Information about general health and nutritional status can also be gained through standard blood analysis. Standing behind the belief that blood testing is an essential component of any program designed to attain optimal health and longevity, Life Extension® offers this innovative and convenient service at a very affordable price. Not only is comprehensive blood testing an important step in safeguarding your health, it is a simple process from virtually anywhere in the United States.

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2. After your order is placed, you will be mailed either a requisition form to take to your local LabCorp Patient Service Center or a Blood Draw Kit; whichever is applicable (Please note: If a blood draw kit is used, an additional local draw fee may be incurred.)
3. Have your blood drawn.
4. Your blood test results will be sent directly to you by Life Extension.
5. Take the opportunity to discuss the results with one of our knowledgeable health advisors by calling 1-800-226-2370; or review the results with your personal physician.

It’s that simple! Don’t delay—call today!

For Our Local Customers:
For those residing in the Ft. Lauderdale, Florida area, blood draws are also performed at the Life Extension Nutrition Center from 9:00 am to 2:00 pm Monday through Saturday. Simply purchase the blood test and have it drawn with no wait! Our address is 5990 North Federal Highway, Ft. Lauderdale, FL, 33308-2633.
This test is packaged as a kit, requiring a finger stick performed at home. This panel looks at vascular inflammatory biomarkers, Total and Free Testosterone, DHEA-S, Free T3, Free T4, Cortisol, C-Reactive Protein (high sensitivity), Vitamin B12, Folate, Insulin.

The panel contains the following tests:

- F2-Isoprostanes
- Myeloperoxidase
- OxLDL

ADVANCED OXIDIZED LDL PANEL*

This panel looks at vascular inflammatory biomarkers, beginning with lifestyle choices to the development of metabolic as well as cardiovascular disease and the formation of vulnerable plaque. The panel contains the following tests: F2-Isoprostanes, Myeloperoxidase, and Oxidized LDL.

ADVANCED CARDIAC BIOMARKERS

These biomarkers provide an early warning of cardiovascular disease. OxLDL is a powerful initiator of inflammatory changes in the artery wall, which eventually lead to the formation of plaque.

Other Popular Tests and Panels

- NUTRIENT PANEL* (LC100024)
  - Vitamin B12, Folate, Vitamin D 25-hydroxy, Vitamin C, Vitamin A, Selenium, Zinc, CoQ10, and RBC Magnesium.
- CHRONIC FATIGUE PROFILE (LC100005)
  - CBC/Chemistry Profile (see description previous page), Epstein – Barr Virus antibodies (IgG and IgM), Cytomegalovirus Antibodies (IgG and IgM), Ferritin, Total and Free Testosterone, DHEA-S, Free T3, Free T4, Cortisol, C-Reactive Protein (high sensitivity), Vitamin B12, Folate, Insulin.
- ANEMIA PANEL* (LC100006)
  - CBC/Chemistry Profile (see description previous page), Ferritin, Total Iron Binding Capacity (TIBC), Vitamin B12, Folate
- AUTOIMMUNE DISEASE SCREEN* (LC100041)
  - ANA screen, hs-CRP, TNF, Immunoglobulins, IgA, IgG, IgM
- DIABETES MANAGEMENT PROFILE – COMPREHENSIVE (LC100040)
  - Hemoglobin A1C, Glucose, Insulin, Lipid Panel, Glycemark
- DIABETES MANAGEMENT PROFILE – BASIC (LC100039)
  - Hemoglobin A1C, Glucose, Insulin
- ADVANCED CARDIAC BIOMARKERS
- ADVANCED OXIDIZED LDL PANEL* (LC100035)
  - This panel looks at vascular inflammatory biomarkers, beginning with lifestyle choices to the development of metabolic as well as cardiovascular disease and the formation of vulnerable plaque. The panel contains the following tests: F2-Isoprostanes, Myeloperoxidase, and Oxidized LDL.
- OXIDIZED LDL PANEL* (LC100034)
  - This panel looks at vascular inflammatory biomarkers, beginning with the development of metabolic as well as cardiovascular disease and the formation of vulnerable plaque. The panel contains the following tests: Myeloperoxidase and Oxidized LDL.
- OXIDIZED LDL (LC817472)
  - OXoLDL is a powerful initiator of inflammatory changes in the artery wall, which eventually lead to the formation of plaque.

TERMS AND CONDITIONS

This blood test service is for informational purposes only and no specific medical advice will be provided. National Diagnostics, Inc., and Life Extension® contract with a physician who will order your test(s), but will not diagnose or treat you. Both the physician and the testing laboratory are independent contractors and neither National Diagnostics, Inc., nor Life Extension® will be liable for their acts or omissions. Always seek the advice of a trained health professional for medical advice, diagnosis, or treatment. When you purchase a blood test from Life Extension/National Diagnostics, Inc., you are doing so with the understanding that you are privately paying for these tests. There will be absolutely no billing to Medicare, Medicaid, or private insurance. I have read the above Terms and Conditions and understand and agree to them.

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 Phone

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 Expiration Date /

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 Phone your order to: 1-800-208-3444

 Fax your order to: 1-866-728-1050

 Blood tests available in the continental United States only.
 Restrictions apply in NY, NJ, PA, RI, and MA. Not available in Maryland.

 This is NOT a complete listing of LE blood test services. Call 1-800-208-3444 for additional information.

 With Your Healthy Rewards, you earn LE Dollars back on every purchase you make — including blood tests! See www.LifeExtension.com/Rewards for details.

 * This test requires samples to be shipped to the lab on dry ice for customers using a Blood Draw Kit and will incur an additional $35 charge. If the customer is having blood drawn at a LabCorp facility, this extra charge does not apply.
 ** This test is packaged as a kit, requiring a finger stick performed at home.
| DNA Protection Formula |
| Enhanced Berry Complete with Acai |
| Essential Daily Nutrients |
| Grapeseed Extract with Resveratrol & Pterostilbene |
| Mega Green Tea Extract (decaffeinated) |
| Mega Green Tea Extract (lightly caffeinated) |
| Optimized Fucoidan with Maritech® 926 |
| Optimized Resveratrol with NAD+, Cell Regenerator™ |
| Optimized Resveratrol with Synergistic Grape-Berry Actives |
| pTERoPure® |
| Pycnogenol® French Maritime Pine Bark Extract |
| Resveratrol with Pterostilbene |
| RNA (Ribonucleic Acid) |
| Super Alpha-Lipoic Acid |
| Super R-Lipoic Acid |

**Men’s Health**

- Mega Lycopene Extract
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- PalmettoGuard® Saw Palmetto/Nettle Root Formula with Beta-Sitosterol
- Pome-T®
- Prelox® Natural Sex for Men®
- Super MiraForte with Standardized Lignans
- Triple Strength ProstaPollen™

**Minerals**

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

**Miscellaneous**

- Advanced Iodine Complete
- SolarShield® Sunglasses

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- 5 HTP
- L-Theanine
- Natural Stress Relief
- SAMe (S-Adenosyl-Methionine)

**Multivitamins**

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

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- Biosil
- Dr. Proctor’s Advanced Hair Formula
- Dr. Proctor’s Shampoo
- European Leg Solution Featuring Certified Diosmin 95
- Face Master Platinum
- Facial Toning System
- Hair Suppressing Formula

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- FlorAssist®
- Jarro-Dophilus EPS®
- Therac-10® Probiotics
- TruFlora® Probiotics

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- Advanced Brightening Cream
- Advanced Peptide Hand Therapy
- Advanced Triple Peptide Serum
- Advanced Under Eye Serum with Stem Cells
- Amber Self MicroDermAbrasion
- Anti-Aging Face Oil
- Anti-Aging Mask
- Anti-Aging Rejuvenating Face Cream
- Anti-Glycation Serum with Blueberry & Pomegranate Extracts
- Antioxidant Facial Mist
- Anti-Oxidant Rejuvenating Foot Cream
- Anti-Oxidant Rejuvenating Foot Scrub
- Anti-Oxidant Rejuvenating Hand Cream
- Anti-Redness & Adult Blemish Lotion
- Bioflavonoid Cream
- Broccoli Sprout Cream
- Collagen Boosting Peptide Serum
- Corrective Clearing Mask
- DNA Repair Cream
- Dual-Action MicroDermAbrasion
- Enhanced FerrBlock® with Red Orange Complex
- Essential Plant Lpidis Reparative Serum
- Fine Line-Less Healing Formula
- Healing Mask
- Healing Vitamin K Cream
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- Hyaluronic Oil-Free Facial Moisturizer
- Hydrating Anti-Oxidant Facial Mist
- Hydroderm
- Lifting & Tightening Complex
- Lycopene Cream
- Melatonin Cream
- Mild Facial Cleanser
- Multi Stem Cell Skin Tightening Complex
- Neck Rejuvenating Anti-Oxidant Cream
- Pigment Correcting Cream
- Rejuvenating Serum
- Rejuvenex® Body Lotion
- Rejuvenex® Factor Firming Serum
- Renewing Eye Cream
- Resveratrol Anti-Oxidant Serum
- Skin Lightening Serum
- Skin Restoring Phytoceramides with Lipowheat®
- Skin Stem Cell Serum
- Stem Cell Cream with Alpine Rose
- Tightening & Firming Neck Cream
- Ultra Lip Plumper
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- Under Eye Rescue Cream
- Vitamin C Serum
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- Vitamin E-essential Cream
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- Low-Dose Vitamin K2
- Methylcobalamin
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- Optimized Folate (L-Methylfolate)
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- Super Absorbable Tocotrienols
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- Super K with Advanced K2 Complex
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- Natural Estrogen without Soy Isoflavones
- Natural Estrogen
- ProgestaCare® for Women
- Super-Absorbable Soy Isoflavones
- Ultra Soy Extract
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### SUBTOTAL OF COLUMN 1

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**SUBTOTAL OF COLUMN 3**

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<th>GTY Total</th>
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<td>19.50</td>
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<tr>
<td>80149</td>
<td>YOUTH SERUM • 1 oz</td>
<td>65.00</td>
<td>48.75</td>
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<td>42.75</td>
</tr>
</tbody>
</table>

**SUBTOTAL OF COLUMN 4**

**TO ORDER CALL: 1.954.766.8433 or 1.800.544.4440 TO ORDER ONLINE VISIT: www.LifeExtension.com**

**RECEIVE 25% OFF THE RETAIL PRICE OF ALL PRODUCTS**

**NOVEMBER 2015**
<table>
<thead>
<tr>
<th>ITEM No.</th>
<th>PRODUCT</th>
<th>Retail Each®</th>
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<tbody>
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<td>00056</td>
<td>JARRD-DOPHILUS EPS® • 60 veg. caps</td>
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<td>00054</td>
<td>JARRD-DOPHILUS EPS® • 30 caps</td>
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<tr>
<td>00724</td>
<td>K W/ADVANCED K2 COMPLEX (Super) • 90 softgels</td>
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<tr>
<td>00680</td>
<td>KRILL HEALTHY JOINT FORMULA • 30 softgels</td>
<td>32.00</td>
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<td>00150</td>
<td>KRILL OIL • 60 softgels</td>
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<td>00316</td>
<td>KYOLIC® GARLIC FORMULA 102 • 200 veg. caps</td>
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<td>00214</td>
<td>KYOLIC® GARLIC FORMULA 105 • 250 caps</td>
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<td>00079</td>
<td>KYOLIC® RESERVE • 600 mg, 120 caps</td>
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<tr>
<td>00161</td>
<td>LACTOFERRIN • 60 caps</td>
<td>52.00</td>
<td>39.00</td>
<td>36.00</td>
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<tr>
<td>00020</td>
<td>LECITHIN • 16 oz granules</td>
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<tr>
<td>00195</td>
<td>LIFE EXTENSION MIX™ • 315 tablets</td>
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<tr>
<td>00197</td>
<td>LIFE EXTENSION MIX™ • EXTRA NIAIN® • 315 tablets</td>
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<td>60.00</td>
<td>52.00</td>
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<tr>
<td>00190</td>
<td>LIFE EXTENSION MIX™ • 490 caps</td>
<td>90.00</td>
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SUBTOTAL OF COLUMN 5

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<td>00541</td>
<td>GLUTATHIONE, CYSTEINE &amp; C • 100 veg. caps</td>
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<td>00314</td>
<td>L-GLUTATHIONE (Mega) • 250 mg, 60 caps</td>
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<td>01967</td>
<td>GLYCATION PROTECTION FORMULA • 60 veg. caps</td>
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<td>GLYCINE • 1,000 mg, 100 veg. caps</td>
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<td>GRAPE SEED EXTRACT W/RESVERATROL &amp; PTEROSTILBENE 100 mg, 60 veg caps</td>
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<td>01604</td>
<td>GREEN COFFEE EXTRACT COFFEEGENIC® 200 mg, 90 veg caps</td>
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<td>01620</td>
<td>GREEN COFFEE EXTRACT COFFEEGENIC® 400 mg, 90 veg caps</td>
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<td>00953</td>
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<td>00954</td>
<td>GREEN TEA EXTRACT (Mega) • decaffeinated, 100 veg caps</td>
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<td>01545</td>
<td>GUTSY CHEWY DIGESTIVE (Citrus flavor) • 8 tablets</td>
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<td>01546</td>
<td>GUTSY CHEWY DIGESTIVE (Widberry flavor) • 8 tablets</td>
<td>11.50</td>
<td>8.63</td>
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SUBTOTAL OF COLUMN 6

TO ORDER ONLINE VISIT: www.LifeExtension.com

QTY Total
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<th>ITEM No.</th>
<th>PRODUCT</th>
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<td>LIFE EXTENSION MIX™ POWDER • 14.81 oz</td>
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<td>01966</td>
<td>LIFE EXTENSION MIX™ • 315 tablets w/o copper</td>
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<tr>
<td>01967</td>
<td>LIFE EXTENSION MIX™ • 490 caps w/o copper</td>
</tr>
<tr>
<td>01968</td>
<td>LIFE EXTENSION FORMULA • 14.81 oz w/o copper</td>
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<tr>
<td>01608</td>
<td>LIVER EFFICIENCY FORMULA • 30 veg. caps</td>
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<tr>
<td>01639</td>
<td>5-LOX INHIBITOR W/APRÈSFLEX® • 100 mg, 60 veg. caps</td>
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<td>01678</td>
<td>L-LYSINE • 620 mg, 100 veg. caps</td>
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<tr>
<td>00455</td>
<td>LYPENINE (Mega) • 15 mg, 90 softgels</td>
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<td>01855</td>
<td>MACUGUARD® OCULAR SUPPORT • 60 softgels</td>
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<td>01866</td>
<td>MACUGUARD® OCULAR SUPPORT w/ASTAXANTHIN 60 softgels</td>
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<tr>
<td>01459</td>
<td>MAGNESIUM CAPS • 500 mg, 100 veg. caps</td>
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<td>01682</td>
<td>MAGNESIUM (Citrate) • 160 mg, 100 veg. caps</td>
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<td>01908</td>
<td>MEDITERRANEAN TRIM WITH SINETROL™-XPUR 60 caps</td>
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<td>01668</td>
<td>MELATONIN • 300 mcg, 100 veg. caps</td>
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<td>01083</td>
<td>MELATONIN • 500 mcg, 200 veg. caps</td>
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<td>00329</td>
<td>MELATONIN • 1 mg, 60 caps</td>
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<td>MELATONIN • 3 mg, 60 caps</td>
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<td>00331</td>
<td>MELATONIN • 10 mg, 60 caps</td>
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<td>00332</td>
<td>MELATONIN • 3 mg, 60 veg. lozenges</td>
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<td>01734</td>
<td>MELATONIN (Fast-Acting Liquid) • 2 oz (Citrus-Vanilla)</td>
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<td>01787</td>
<td>MELATONIN TIMED RELEASE • 300 mcg, 100 veg. tabs</td>
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<td>01788</td>
<td>MELATONIN TIMED RELEASE • 750 mcg, 60 veg. tablets</td>
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<tr>
<td>01766</td>
<td>MELATONIN TIMED RELEASE • 3 mg, 60 veg. tabs</td>
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<tr>
<td>01536</td>
<td>METHYLCOBALAMIN • 1 mg, 60 veg. lozenges (vanilla)</td>
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<td>01537</td>
<td>METHYLCOBALAMIN • 5 mg, 60 veg. lozenges (vanilla)</td>
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<td>00709</td>
<td>MIGRA-EEZE™ (Bitterbur) • 60 softgels</td>
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<td>01800</td>
<td>MIGRA-MAG w/BRAIN SHIELD™ • 90 veg. caps</td>
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<td>01522</td>
<td>MILK THISTLE (European) • 60 veg. caps</td>
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<td>01822</td>
<td>MILK THISTLE (European) • 60 softgels</td>
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<td>01817</td>
<td>MILK THISTLE (European) • 120 softgels</td>
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<td>01698</td>
<td>MIRAForte w/STANDARDIZED LIGNANS (Super) • 120 caps</td>
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<td>01699</td>
<td>MITOCHONDRIAL BASICS W/BIOPOQ® • 30 caps</td>
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<td>01680</td>
<td>MITOCHONDRIAL ENERGY OPTIMIZER w/BIOPOQ®+ • 120 caps</td>
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<tr>
<td>00656</td>
<td>MK-7 • 90 mcg, 60 softgels</td>
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<tr>
<td>00451</td>
<td>MSM (Methylsulfonylmethane) • 1,000 mg, 100 caps</td>
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**SUBTOTAL OF COLUMN 7**
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<th>ITEM No.</th>
<th>PRODUCT</th>
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<th>QTY Total</th>
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<td>SAMe (S-ADENOSYL-METHIONINE) 400 mg, 20 enteric coated tablets</td>
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<tr>
<td>01740</td>
<td>SEA-IODINE™ • 1,000 mcg, 60 veg. caps</td>
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<td>00046</td>
<td>SILYMARIN • 100 mg, 50 veg. caps</td>
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<td>01249</td>
<td>SINUS CLEANSER • 4 oz bottle</td>
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<td>00596</td>
<td>SKIN RESTORING PHYTOCERAMIDES w/LIPOWHEAT® 30 veg. liquid caps</td>
<td>$25.00</td>
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<td>00961</td>
<td>SODIUM™ w/OLISODIN® &amp; WOLFBERRY • 90 veg. caps</td>
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<td>00657</td>
<td>SOLARSHIELD® SUNGLASSES • Smoke color</td>
<td>$12.99</td>
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<td>01097</td>
<td>SOY EXTRACT (Ultra) • 150 veg. caps</td>
<td>$87.00</td>
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<td>00432</td>
<td>STEVIA® (Better) • 100 packets, 1 gram each</td>
<td>$9.95</td>
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<td>00438</td>
<td>STEVIA® ORGANIC LIQUID SWEETENER (Better) • 2 oz</td>
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<td>01476</td>
<td>STRONTIUM • 750 mg, 90 veg. caps</td>
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<td>01649</td>
<td>SUPER ABSORBABLE SOS ISOLAVONES • 60 veg. caps</td>
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<tr>
<td>01778</td>
<td>SUPER SELENIUM COMPLEX • 200 mcg, 100 veg. caps</td>
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**SUBTOTAL OF COLUMN 9**
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<tr>
<td>01914</td>
<td>TWO-PER-DAY • 120 caps</td>
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<tr>
<td>00326</td>
<td>L-TYROSINE • 500 mg, 100 tablets</td>
<td>12.98</td>
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<td>00213</td>
<td>VANADYL SULFATE • 7.5 mg, 100 veg. tablets</td>
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<td>04008</td>
<td>VENOTONE • 60 caps</td>
<td>18.95</td>
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<td>01327</td>
<td>VINPOCETINE • 10 mg, 100 veg. tablets</td>
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<td>00372</td>
<td>VITAMIN B3 NIACIN • 500 mg, 100 caps</td>
<td>7.65</td>
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<td>00098</td>
<td>VITAMIN B5 • 500 mg, 100 caps (Pantothenic Acid)</td>
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<td>01535</td>
<td>VITAMIN B6 • 250 mg, 100 veg. caps</td>
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<td>00361</td>
<td>VITAMIN B12 • 500 mcg, 100 lozenges</td>
<td>8.75</td>
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<td>01634</td>
<td>VITAMIN C w/DIHYDROQUERCETIN • 1,000 mg, 60 veg. tablets</td>
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<td>00927</td>
<td>VITAMIN C w/DIHYDROQUERCETIN • 1,000 mg, 250 veg. tablets</td>
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<td>00084</td>
<td>VITAMIN C POWDER (BUFFERED) • 454 grams</td>
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<td>VITAMIN C-MAGNESIUM CRYSTALS (EFFERVESCENT) 180 grams</td>
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<td>01732</td>
<td>VITAMIN D3 • 2,000 IU, 1 fl oz, Mint flavor</td>
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<td>01753</td>
<td>VITAMIN D3 • 1,000 IU, 90 softgels</td>
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<td>01751</td>
<td>VITAMIN D3 • 1,000 IU, 250 softgels</td>
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<td>VITAMIN D3 • 5,000 IU, 60 softgels</td>
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<td>01718</td>
<td>VITAMIN D3 • 7,000 IU, 60 softgels</td>
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<tr>
<td>01758</td>
<td>VITAMIN D3 W/SEA-IODINETM • 5,000 IU, 60 caps</td>
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<td>00864</td>
<td>VITAMIN D3 LIQUID EMULSION • 2,000 IU, 1 oz.</td>
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<td>01840</td>
<td>VITAMINS D AND K W/SEA-IODINETM • 60 caps</td>
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<td>01763</td>
<td>VITAMIN E (Natural) • 400 IU, 100 softgels</td>
<td>30.00</td>
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<td>01225</td>
<td>VITAMIN K2 (Low-dose) • 45 mcg, 90 softgels</td>
<td>18.00</td>
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**BOOKS**

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<td>33880</td>
<td>OUTSTANDING HEALTH: THE 6 ESSENTIAL KEYS TO MAXIMIZE YOUR ENERGY AND WELL BEING by Michael Galetzka, MD &amp; Larry Trivieri Jr. • 2015</td>
<td>24.95</td>
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<td>33878</td>
<td>TESTOSTERONE REPLACEMENT THERAPY by Dr. John Cistrier • 2015</td>
<td>19.99</td>
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<td>33877</td>
<td>THE TRUTH ABOUT MEN AND SEX by Abraham Morgentaler, MD, FACS • 2015</td>
<td>16.99</td>
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<td>33876</td>
<td>TÖX-SICK • by Suzanne Somers • 2015</td>
<td>26.00</td>
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<tr>
<td>33875</td>
<td>DOCTORED: THE DISILLUSIONMENT OF AN AMERICAN PHYSICIAN • by Sandeep Jhauhar • 2015</td>
<td>26.00</td>
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<tr>
<td>33874</td>
<td>MISSING MICROBES • by Martin J. Blaser, MD • 2014</td>
<td>28.00</td>
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<td>33873</td>
<td>EATING ON THE WILD SIDE • by Jo Robinson • 2014</td>
<td>16.00</td>
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<td>33872</td>
<td>GET SERIOUS • by Brett Osborn, MD • 2014</td>
<td>24.95</td>
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**SUBTOTAL OF COLUMN 12**

- These products are not 25% off retail price.
- ** Due to license restrictions, this product is not for sale to customers outside of the USA.
- *** Due to license restrictions, this product is not for sale to customers outside of the USA and Canada.
- † Due to license restrictions, this product is not for sale outside of the USA.

**SUBTOTAL OF COLUMN 11**

**Not sure exactly which supplements you need?**

Talk to a Health Advisor toll-free at 1-800-226-2370
## ORDER SUBTOTALS

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## ORDER TOTALS

| Subtotal of Columns 1 - 12 | $5.50          |

### POSTAGE & HANDLING
(Any size order, in the U.S. includes Alaska & Hawaii)

- **$5.50**

### C.O.D.s (ADD $7 FOR C.O.D. ORDERS)
- UPS OVERNIGHT add $16
- UPS 2nd DAY AIR add $7
- For Puerto Rico, US Virgin Islands, add $7
- CANADA UPS EXPRESS Flat rate $17.50, UK Flat rate $25 USD
- ALL OTHER INTERNATIONAL AIR WILL BE ADDED

## GRAND TOTAL
(MUST BE IN U.S. DOLLARS)

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**Learn more about YOUR HEALTHY REWARDS**

Call toll-free 1-888-224-8239

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* You earn LE Dollars on all your Life Extension purchases (except shipping fees, CHOICE and Premier program fees, Life Extension Magazine® subscriptions, or any purchases made with LE Dollars or gift card). Redeem LE Dollars for any purchase such as products, labs, sale items, and shipping fees. LE Dollars may not be redeemed for Premier program fees, CHOICE program fees, Life Extension Magazine® subscriptions, or to purchase Gift Cards. LE Dollars have no cash value and are not redeemable for cash, transferable, or assignable for any reason.

† CHOICE Standard pre-paid shipping offers unlimited shipping to any mailing address within the 50 U.S. states, excluding U.S. territories. CHOICE also gives you discounts on non-standard shipping, shipping outside of the United States, and expedited shipping costs. CHOICE pre-paid unlimited shipping excludes blood test products and gift cards. This offer is not available to international customers serviced by distributors of Life Extension products.

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(MUST BE IN U.S. DOLLARS)

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**PLEASE MAIL TO:** Life Extension

P.O. Box 407198 • Ft. Lauderdale, Florida 33340-7198

Or Call Toll Free 1-800-544-4440 • Fax: 866-728-1050

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**BILL TO ADDRESS**

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Prices subject to change without notice. Please notify Life Extension of any address change.
Better Bones by Design
2%-4% of your skeleton is “rebuilt” every year as calcium and minerals leave the bone and must be replaced.

Jarrow Formulas® Presents . . .
A Complete Multi-Nutrient Bone Health System!

Bone-Up® provides your body with much needed calcium as well as essential nutrients for building strong bones.* It utilizes the finest source of calcium available: New Zealand bovine bone hydroxyapatite from chemical-free, range grazed calves less than two years old.

Bone-Up® is an effective addition to any bone health regimen.* It features added vitamins and minerals that synergistically support healthy bone density and overall bone health*:

- **Stimucal™ Ossein Microcrystalline Hydroxyapatite (MCHA):** Promotes calcium balance.*
- **Vitamin D₂:** Converts to calcitriol to enhance calcium absorption.
- **MK-7:** The more bioavailable form of Vitamin K₂, which is needed for building bone matrix and proper calcium distribution.*
- **Boron:** A trace mineral important in calcium retention.*
- **Manganese, Copper and Zinc:** Essential trace minerals involved in the formation of bone.*

If you buy four bottles, the price will be reduced to $20.41 per bottle.
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We have always been about Quality.

You care about the quality of your family’s supplements. We do too.

Master Supplements Inc. is proud that we have been posting online test results for every single lot of our products for over ten years. These tests verify the purity, potency and high quality of our powerful product line. We rely on ingredients that are backed with scientific research, clinical studies and years of efficacy. We have protected our unique technology with 16 U.S. patents, providing formulas that support digestive and immune health. Our probiotics, fiber and enzyme supplements all help restore digestive comfort, regularity, and energy*.

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Call Life Extension to place your order today. 1-800-544-4440

*These statements have not been evaluated by the Food and Drug Administration. These products are not intended to diagnose, treat, cure or prevent any disease.
Fortify Your Immune System with AHCC®

A Clinically Proven and Patented Medicinal Mushroom Extract

Every year, 23 million days of work are lost to feeling under the weather. While most people view immune challenges as part and parcel of the cold weather season, they are not, in fact, inevitable. After all, many people manage to stay well all year round, even though they are exposed to the same environments as those who have weaker resistance. The reason is because the environment is not responsible for whether you feel well or not. Your immune system is.

Innate Versus Adaptive Immunity

You have two basic types of immunity: innate and adaptive. Your innate immunity launches an immediate, general attack against a threat. Your adaptive immunity takes longer to kick in, but produces a targeted, specific response to a threat. Very few natural compounds have the ability to augment both innate and adaptive immunity. AHCC® (short for Active Hexose Correlated Compound) is one exception.*

How AHCC® Works

AHCC® is a patented, fermented, medicinal mushroom extract whose efficacy is supported by over 20 human clinical research studies. It has been shown to modulate immune response in several ways.

- AHCC® enhances the production of cytokines, the messengers of the immune system, so that your whole immune team can coordinate an organized response to outside threats.*
- AHCC® boosts populations of macrophages, the “street cleaners” of your immune system, which pick up foreign substances and cellular debris.*
- AHCC® increases the activity of natural killer (NK) cells, your innate immune system’s first line of defense against invasion.*
- And AHCC® raises levels of dendritic cells and T cells, key players in your adaptive immune system’s highly specialized response to specific threats.*

Item# 29727
Retail $74.95
30% OFF
Your Price $52.47

Kinoko® Gold AHCC

Significantly improves immune response* Maintains peak natural killer cell activity supported by over 20 human studies*

Daily Supplement: 40 Vegicaps 500 mg

*These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease.
FINALLY AN IMMUNE FORMULA THAT SCORES A PERFECT 10

Ten Mushroom®

- All Season, Year-Round Immune Support*
- Safe for Everyday Use*
- Organically Grown in the Pacific Northwest*

Ten Mushroom® is a synergistic blend of ten organic mushroom varieties, carefully selected based on their broad-spectrum benefits for immune and overall health. Additional beta-glucans give an extra boost to help optimize immune function.

For thousands of years, traditional cultures have relied on medicinal mushrooms to promote optimal health and longevity. Ten Mushroom® is designed based on this time-honored wisdom, and substantiated with extensive research on the broad-spectrum health benefits offered by each mushroom in this unique formula.

This synergistic mushroom blend delivers powerful yet gentle support for immune health, with additional organ-specific benefits to help you reach optimal vitality. Organically grown in a controlled indoor environment and packaged under strict GMP guidelines, Ten Mushroom® uses the vegetative mycelium of each mushroom, rather than the spore-containing fruiting body (which often cause allergic reactions).

Gentle, nourishing and pure, Ten Mushroom® is an ideal formula to protect and promote long-term health.*

Finally, an immune formula that scores a perfect Ten!

To order Ten Mushroom®, call 1-800-544-4440 or visit www.LifeExtension.com

*These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure or prevent any disease.
Used medicinally for over 4,000 years, curcumin benefits almost every organ in the body. The challenge in obtaining these benefits is that most supplements are poorly absorbed into the bloodstream and are not well retained in the body.

Life Extension’s curcumin supplements utilize a patented, bio-enhanced curcumin preparation that can reach up to 7 times higher concentrations in the blood than standard curcumin.

Studies comparing standard curcumin to Super Bio-Curcumin® and Advanced Bio-Curcumin® with Ginger & Turmerones found:

- Nearly 2 times the support for immune health,
- Nearly twice the support for healthy inflammatory response, and
- Approximately double the free-radical fighting support.

Life Extension offers the choice of two super-absorbing curcumin formulas that require only one serving a day dosing:

- **Super Bio-Curcumin®** provides optimal potency of highly absorbable curcumin.

- **Advanced Bio-Curcumin® with Ginger & Turmerones** provides the following additional nutrients for those seeking more comprehensive support for prolonged functional inflammatory responses:
  - Ginger to complement health benefits,
  - Turmerones to increase the amount of curcumin inside cells, and
  - Phospholipids to further enhance absorption.


References

To order Super Bio-Curcumin® or Advanced Bio-Curcumin® with Ginger & Turmerones, call 1-800-544-4440 or visit www.LifeExtension.com

These statements have not been evaluated by the Food and Drug Administration. These products are not intended to diagnose, treat, cure, or prevent any disease.
Scientists are studying a single drug that may attack “the biological process of aging.” Twenty years after Life Extension® recommended this approach, innovative scientists are finally investigating the ability of this compound to delay the effects of aging.

Most animals internally synthesize high amounts of vitamin C. Humans lack this ability and are dependent on dietary or supplement ascorbate sources. In addition to its role in maintaining the body’s collagen structure, vitamin C profoundly augments immune function.

Research suggests that boosting AMPK activity can reverse the life-shortening effects of aging. Insufficient AMPK activity is related to multiple degenerative processes.

To avoid being among the 15,000 who have serious complications from cataract surgery, including blindness, it is important to learn how to select your eye surgeon.