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

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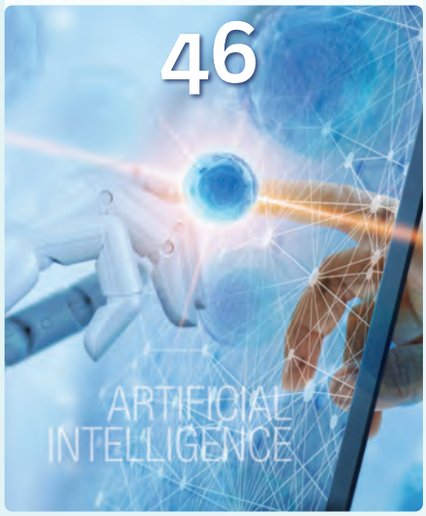

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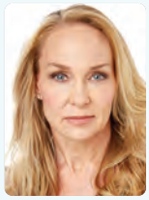

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How to Renew Your Own Stem Cells

*This article describes findings that may enable you to **rejuvenate** your **stem cells** using low-cost approaches available right now.*

WILLIAM FALOON

To put this into historic context, the image on this page is the **March 2002** cover of ***Life Extension***® magazine.

Our message back then was that therapeutic cloning of **stem cells** might enable our biology to be transported back in time to a ***younger*** state.

In that **2002** magazine article, we described how fresh, young **stem cells** can **regenerate** tissues throughout our body, thereby **reversing** the course of degenerative disorders.

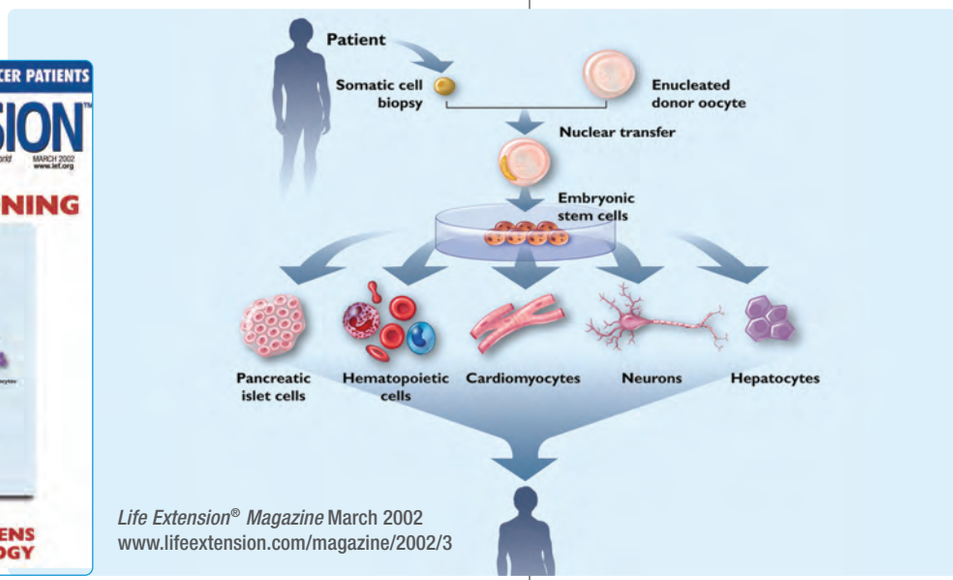
Stem cell **research**, however, was torpedoed by **federal edict** in **2001** and has only recently regained serious momentum.

The encouraging news is that we may be able to **regenerate** our existing pool of stem cells **today**.

The significance of this cannot be overstated.

If we replenish our pool of healthy **stem cells**, we may regain the ability to **repopulate** our tissues with fresh **functional** cells.

The good news is that certain **nutrients** that readers of this magazine *already* supplement with have stem cell-**renewing** properties. This can buy precious time as ongoing **research** develops systemic stem cell **rejuvenation** therapies envisioned 20 years ago.



Life Extension® *Magazine* March 2002
www.lifeextension.com/magazine/2002/3

Stem Cells Needed to Sustain Life

Our tissues rely on **functional cells** to sustain organ viability.

With age, our **functional** cells deteriorate.

In youth, as **functional** cells die off, they are replaced with new cells created from **stem cells** present in our body.[1-3]

Stem cells, however, are affected by the same **degenerative** problems as **functional** cells.[4]

As **stem cell** vitality deteriorates, we lose the ability to **repopulate** tissues with fresh **functional** cells.[4]

What few people understand is that **stem cells** are capable of **self-renewal**, as well as producing mature **functional** cells.[1,4]

In medical practice today, **stem cells** are used for **regenerative** purposes. This is evidenced by the ability of bone marrow **stem cell transplants** to help **leukemia** patients.[5]

Based on the phenomenon of **self-renewal**, if our old stem cells can be reactivated, the effect could be whole-body ***rejuvenation***.

Nutritional interventions may provide an effective approach to activate dormant **stem cells**, thereby enhancing **tissue regeneration**.

Using several lines of preclinical evidence from the scientific literature, we can outline a rational approach that could allow us to **reactivate** aging stem cells.

Stem Cells Are Retained with Age

Many stem cells are retained as we age and have the capacity to **self-renew** and **differentiate** into mature **functional** cells.[4]

Several factors that drive the aging process also reduce the **regenerative** potential of **stem cells** and contribute to worsening of age-related conditions.[4]

We now have a better understanding of specific degenerative pathways of **aged tissues** and how this contributes to disease, decline, and death.[4,6]

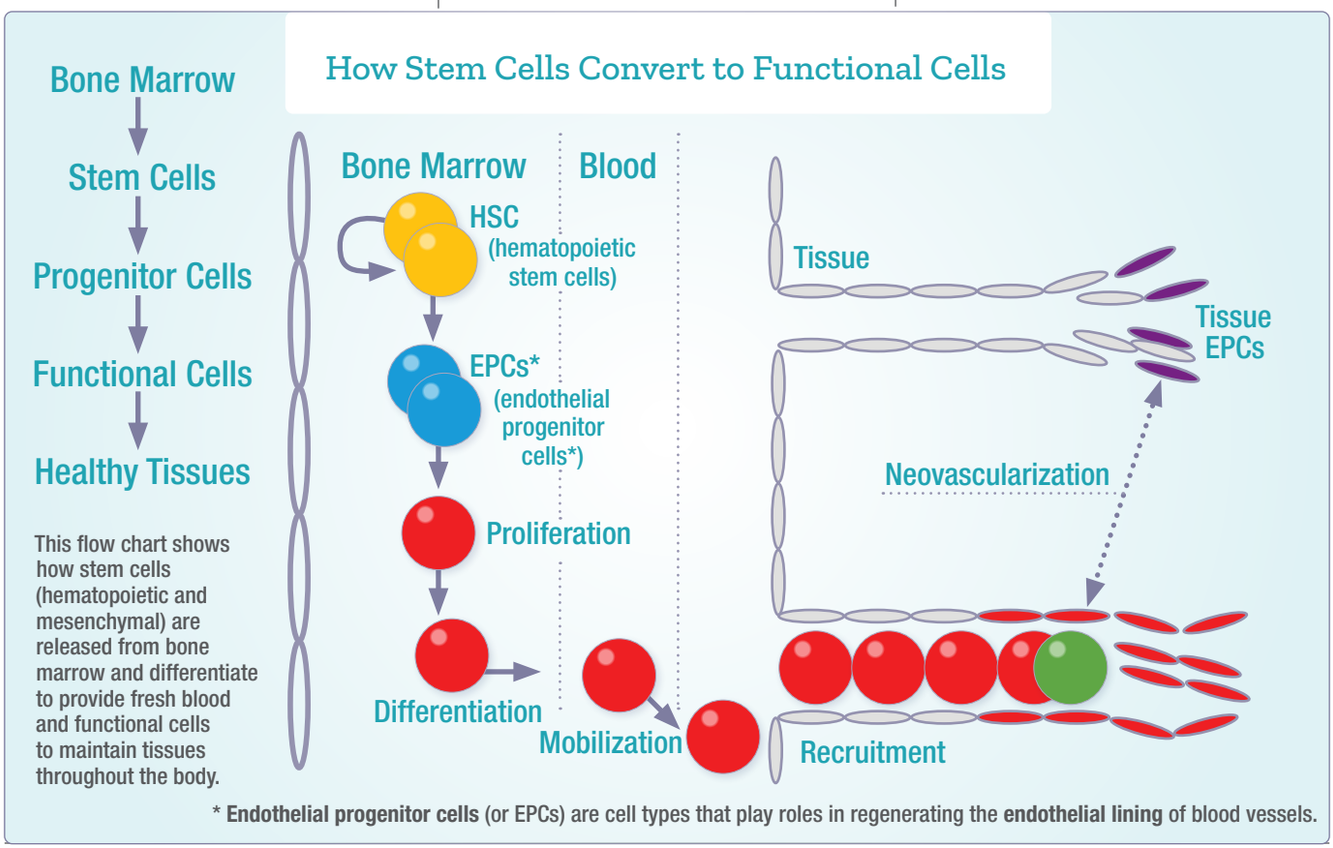
This gives us ***targets*** for restoring stem cell **function** and **self-renewal** using current technologies.[4,6]

Rejuvenating Aged Stem Cells

Normal aging (along with excess calorie ingestion) causes **AMPK** and **NAD+** to plummet, **mTOR** to be imbalanced, and **SIRT1** signaling to be downregulated.[7-10]

The impact of this is depletion of our **stem cell** pools and a reduced regenerative potential.[11]

Stem cell malfunction can be partially corrected with many of the **nutrients** that readers of ***Life Extension®*** magazine supplement with today.



This includes **curcumin**,[12,13] **resveratrol**,[14-16] ***Gynostemma pentaphyllum***,[17] **NAD+** precursors,[18,19] and drugs like metformin,[20-22] along with sensible eating patterns.[23]

Stem Cell Rejuvenation in Laboratory Models

The challenge of maintaining healthy **stem cells** requires fighting off the same damaging factors that compromise our **functional** tissue cells.

These factors include damaged DNA, mitochondrial dysfunction, chronic inflammation, and oxidative stress.

Emerging data indicate that **interventions** that blunt the effects of excessive **calorie intake** can **rejuvenate** some lineages of **stem cells** by:[11,23-25]

- *ACTIVATING* **AMPK**
- *SUPPRESSING* **mTOR**
- *BOOSTING* **sirtuins**

Sirtuins are indispensable for **DNA repair**, controlling **inflammation** and other life sustaining processes. **Resveratrol** activates **sirtuins** but requires **NAD+** for optimal functionality.[26]

In aged mice, treatment with the **NAD+** precursor **nicotinamide riboside** rejuvenated muscle **stem cells**.[19]

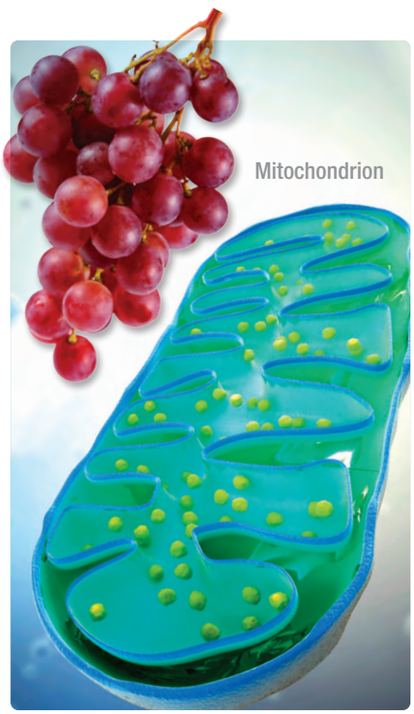
This study showed that boosting NAD+ improved **mitochondrial function** in muscle stem cells and inhibited **stem cell** senescence. The researchers also showed that boosting **NAD+** decreased **senescence** of brain and skin **stem cells**.[19]

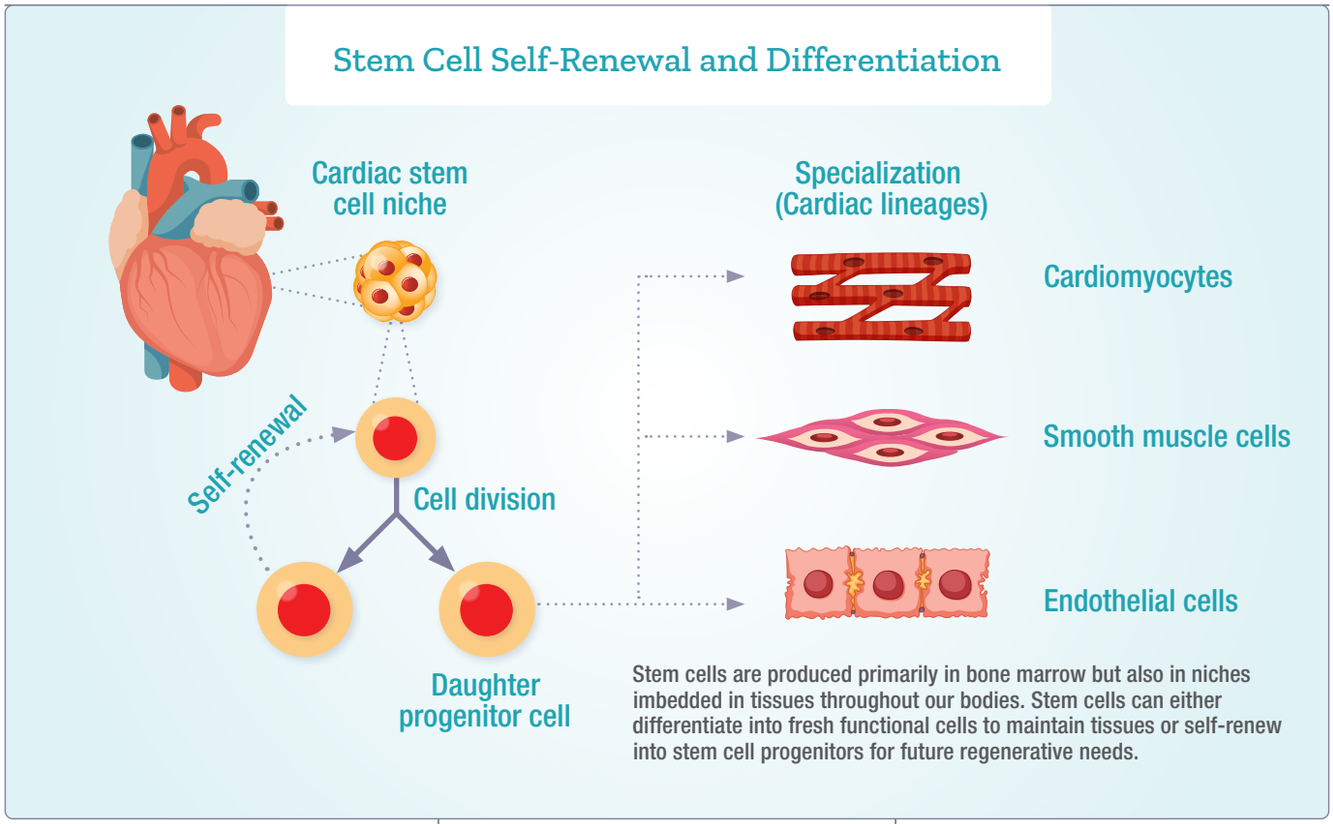
An ongoing clinical trial may reveal neurological improvement in response to aggressive **NAD+** boosting therapy.[27]

Clinical trials have demonstrated that oral administration of **NAD+ precursors** results in increased **NAD+** levels,[28,29] which are vital for **stem cell** functionality.[19]

AMPK
+
Resveratrol
+
NAD+
=
STEM CELL REJUVENATION

In response to **resveratrol**, cells express proteins called **sirtuins** that provide several benefits including generating new **mitochondria**.[30]





Sirtuins are dependent on **NAD+** to interact with **FoxO,** a beneficial transcription factor, to promote healthy **gene expression**.[26,31]

The cellular *enzyme* **AMPK** has a dynamic interaction with **sirtuin 1** (SIRT1).

The potential combined benefit of boosting **AMPK**, **NAD+, SIRT1** and **FoxO** is the favorable impact this might have in promoting **stem cell** health.

Moreover, **AMPK activity** helps to normalize excess **mTOR**, which can impede **stem cell** functionality.[23]

Understanding the Role of mTOR in Obesity and Aging

"mTOR" stands for the ***mechanistic target of rapamycin***.

It is a protein found inside most cells and is responsible for regulating cellular growth by sensing and integrating diverse nutritional and environmental cues.[7]

Excessive activation of cellular **mTOR** is involved in diseases plaguing aging populations, such as cancer, type II diabetes, and obesity.[7]

Regulating **mTOR activity** extends lifespan in laboratory models by delaying the development of chronic diseases, including **cancer**.[32]

Maintenance of stem cell pools requires a finely tuned balance between stem cell renewal and differentiation.[6]

When **mTOR** is excessively activated in certain stem cell lineages, the pool of stem cells becomes **exhausted**.[32] This diminishes our ability to regenerate our tissues with fresh **functional** cells.[6]

When properly balanced, **mTOR** will not adversely impact cellular aging.[33-37]

Enhancing **autophagy** in hematopoietic **stem cells** improves their **regenerative capacity**.[38]

One way of inducing **autophagy** is suppression of excess **mTOR** via **AMPK activation**.[38]

According to a report published in the journal ***Nature:***

"…it will be exciting to test whether rejuvenation interventions aimed at activating autophagy in unhealthy autophagy-inactivated oHSCs [old hematopoietic stem cells] will improve the health of the aging blood system."[38]

Most People Need to Lower mTOR

Regulation of **mTOR** represents a viable approach to preserve the **stem cell** pool.

This, in turn, would help maintain **functionality** of our tissues and organs over time.

When **calorie intake** is reduced, **mTOR** activity diminishes, and **autophagy** is beneficially **activated**.

This process **(autophagy)** cleans up accumulated cellular **waste products** and preserves **cell function**.[39]

The **autophagy-regulating** signaling network that includes **AMPK** and **mTOR** serves to maintain this delicate **autophagy** balance.[40]

Interventions that activate **AMPK** serve to balance **mTOR** and enable optimal levels of cellular **autophagy**.

Boost Cell AMPK To Lower mTOR

AMPK was first identified in **1973** for its role in **fat** metabolism.[41]

Based on evidence from preclinical studies, it is expected that when people practice severe calorie restriction, **AMPK activity** increases, which confers protective effects.[42]

One of AMPK's benefits is to *signal* cells to consume stored **fat**. One way that **AMPK** performs this **fat-removing** process is by down-regulating **mTOR**.[43]

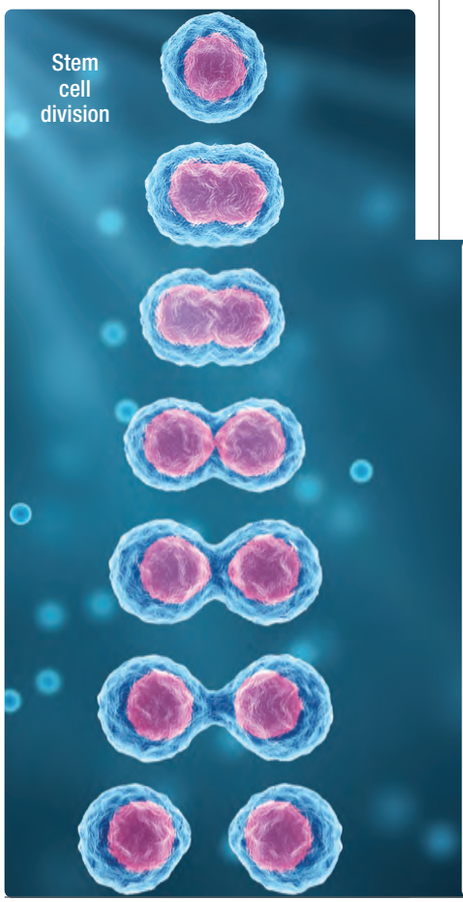
AMPK is a master energy sensor in cells.[35]

When **AMPK** is activated by compounds like **metformin** or ***Gynostemma pentaphyllum***,[35,44] cells think they are energy deprived.

The desired effect for most aging people is to prompt cells to turn down excess **mTOR** and utilize **fat** stores for energy production.

Balancing **mTOR** activity and **autophagy** can be achieved via increasing cellular **AMPK** in the following six ways:

1. Reduce calorie intake and more specifically, avoid sugars and simple carbohydrates. High blood levels of **glucose** (and insulin) fuel excess **mTOR activity**.[45]
2. Brief periods (3-5 days) of **calorie restriction** per month have shown great benefits indicative of balanced mTOR,[46] but compliance is difficult.
3. Consider "**intermittent fasting**" for **14-18** hours five days a week, based on voluminous data, including a fascinating report published in the **December 26, 2019** issue of the ***New England Journal of Medicine***.[47]
4. Preclinical studies show that calorie restriction mimetics such as **resveratrol** and **NAD+** can be used to support SIRT1 and FoxO function.[26,48]
5. **AMPK activators** such as the drug **metformin** and/or nutrients such as ***Gynostemma pentaphyllum*** extract[44,49] and **hesperidin**[50] help support mTOR activity and autophagy.
6. Increased **physical activity** can meaningfully boost AMPK.[51]



Multi-Modal Approach to Stem Cell Renewal

We now know of several factors involved in the maintenance and potential **rejuvenation** of our aging **stem cells.**

The encouraging aspect of all this is we can **target** these stem cell **renewal** processes today via:

1. AMPK activation[35]
2. Sirtuin activation[24,54]
3. FoxO activation[55,56]
4. NAD+ replenishment[19]
5. mTOR regulation (via AMPK activation)[6,57]

This approach may enable elderly individuals to **rejuvenate** their **aged stem cells**, which would then **repopulate** senile tissues with fresh, **functional** (somatic) cells.

Rejuvenating Bone Marrow Stem Cells

The impact of boosting **AMPK** and lowering excess **mTOR** may enable **rejuvenation** of aging bone marrow (hematopoietic) stem cells.

A safe way of balancing **mTOR** is to boost cellular **AMPK** activity.

Increasing **AMPK** regulates **mTOR**, which facilitates removal of cellular debris (via autophagy).[52,53]

As it relates to combatting aging, activating **autophagy** appears to be a critical factor for the **rejuvenation** of aged **hematopoietic stem cells**.[25]

Hematopoietic stem cells are crucial for producing new immune cells, platelets and red blood cells.

Middle aged and elderly people today have ready access to **low-cost** approaches to help preserve their bone marrow **stem cell pools**.

When the **bone marrow** stem cell niche becomes exhausted, life can no longer be sustained.

That's because oxygen-carrying **red blood cells**, immune-protecting **white cells** and hemorrhage-guarding **platelets** must to be continually produced in the **bone marrow** for systemic existence.

Increase SIRT1 with Resveratrol

Resveratrol activates **SIRT1** inside cells, which is linked to many of the same longevity-enhancing benefits as **calorie restriction**.[26]

Based on our interpretation of emerging evidence, age control could be enhanced by modest doses of **resveratrol**, with adequate **NAD+** replenishment to ensure **sirtuin** functionality.

Most people over age 40 should initiate supplementation with the oral **NAD+** precursor (**nicotinamide riboside**) in the daily dose of **300 mg** to **600 mg**, along with **100 mg** to **300 mg** of **resveratrol** and **AMPK-activating** compounds.

By targeting known regulators of stem cell **self-renewal** and **differentiation**, we are proposing a unique protocol to **rejuvenate** your own **stem cells**.

Factors that Confer Stem Cell Health

As it relates to **stem cell regeneration**, the following processes are intimately involved:

1. **DNA repair** pathways affected by:[58]
   SIRT1 **NAD+** **FoxO**
2. **Protein synthesis** affected by:[55]
   AMPK **mTOR** **FoxO**
3. **Mitochondrial function** affected by:[59]
   SIRT1 **NAD+** **FoxO**

Hallmarks of degenerative aging include dysregulation of AMPK, FoxO and SIRT1, depletion of NAD+, and excessive activation of mTOR.[7,60]

In what may be a unified approach to living healthier, the ability to **reactivate** aged **stem cells** is already being practiced by some enlightened people today.

This includes those who take steps to balance **AMPK**, **SIRT1**, **FoxO** and **NAD+** while normalizing excess **mTOR**.

Summary Overview

Adult **stem cells** lose their ability to repopulate tissues with fresh **functional** cells.

The result is systemic deterioration of tissues throughout our aging bodies.

Treatments that are currently being used to slow aging, such as boosting **AMPK** and **sirtuins**, appear likely to facilitate **stem cell rejuvenation**.

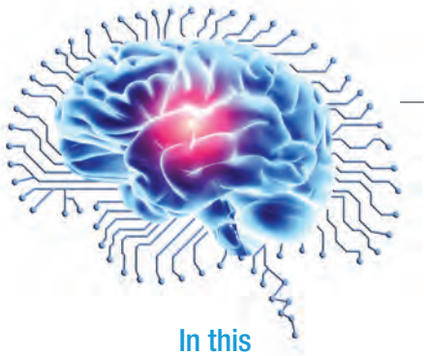
Regulation of **mTOR** enhances the **regenerative** capacity of hematopoietic stem cells in aged mice.[25]

mTOR is hyperactive in the **bone marrow** stem cell niche of aged mice.[25] Excess **mTOR** can be balanced by increasing **AMPK**.

Published data indicate that agents that boost **NAD+**,[19] **sirtuins**[24,54] and **FoxO**,[56] along with compounds that increase **AMPK**[35,44] (and down-regulate **mTOR**[6,25]) may work together to improve **stem cell function**.

Metformin is an FDA-approved drug with potent **AMPK-activating** properties. It and other compounds that activate **AMPK** (like *Gynostemma pentaphyllum*) represent a potential option for induction of stem cell rejuvenation in adult stem cell therapies.

The combined application of these mechanistic approaches in clinical medical practice could induce systemic rejuvenation of dysfunctional stem cells.



In this Month's Issue…

A multi-year investigation using **deep-learning AI** technology has led to the discovery of three natural compounds that favorably modulate *signaling* pathways associated with **stem cell** health.

One of these compounds was shown to promote **hematopoietic stem cell** expansion in a laboratory model, while the other demonstrated reductions in metabolic parameters (like reduced fasting insulin).

This nutrient formula is described on page 46 of this month's issue.

Page 65 describes a published **clinical trial** in which biological **aging** was reversed on average by **2.5 years** using three compounds that have a long history of use.

Page 34 is an **Age Reversal Update** that introduces new human studies, one that aims to achieve meaningful and statistically significant rejuvenation effects in only 12 months.

An article on page 24 reveals how **type II diabetics** may delay or prevent the onset of disabling **neuropathy**.

In the meantime, readers of ***Life Extension***® magazine should appreciate that many of the **nutrients** they take today are demonstrating beneficial effects on the health of their **stem cell** pools.

For longer life,

William Faloon, Co-Founder
Life Extension Buyers Club

References

1. Available at: https://stemcells.nih.gov/info/basics/1.htm. Accessed December 9, 2019.
2. Boyette LB, Tuan RS. Adult Stem Cells and Diseases of Aging. *J Clin Med.* 2014 Jan 21;3(1):88-134.
3. Ren R, Ocampo A, Liu GH, et al. Regulation of Stem Cell Aging by Metabolism and Epigenetics. *Cell Metab.* 2017 Sep 5;26(3):460-74.
4. Oh J, Lee YD, Wagers AJ. Stem cell aging: mechanisms, regulators and therapeutic opportunities. *Nat Med.* 2014 Aug;20(8):870-80.
5. Available at: https://www.cancer.org/cancer/acute-myeloid-leukemia/treating/bone-marrow-stem-cell-transplant.html. Accessed December 9, 2019.
6. Ito K, Suda T. Metabolic requirements for the maintenance of self-renewing stem cells. *Nat Rev Mol Cell Biol.* 2014 Apr;15(4):243-56.
7. Laplante M, Sabatini DM. mTOR signaling in growth control and disease. *Cell.* 2012 Apr 13;149(2):274-93.
8. Salminen A, Kaarniranta K, Kauppinen A. Age-related changes in AMPK activation: Role for AMPK phosphatases and inhibitory phosphorylation by upstream signaling pathways. *Ageing Res Rev.* 2016 Jul;28:15-26.
9. Imai SI, Guarente L. It takes two to tango: NAD(+) and sirtuins in aging/longevity control. *NPJ Aging Mech Dis.* 2016 08/18/online;2:16017.
10. Massudi H, Grant R, Braidy N, et al. Age-associated changes in oxidative stress and NAD+ metabolism in human tissue. *PLoS One.* 2012;7(7):e42357.
11. Khorraminejad-Shirazi M, Farahmandnia M, Kardeh B, et al. Aging and stem cell therapy: AMPK as an applicable pharmacological target for rejuvenation of aged stem cells and achieving higher efficacy in stem cell therapy. *Hematol Oncol Stem Cell Ther.* 2018 Dec;11(4):189-94.
12. Sharifi S, Zununi Vahed S, Ahmadian E, et al. Stem Cell Therapy: Curcumin Does the Trick. *Phytother Res.* 2019 Nov;33(11):2927-37.

How FoxO Enhances Stem Cell Health

Bone-marrow-derived stem cells are termed **hematopoietic stem cells** and are essential to sustaining life processes.

FoxO (Forkhead box) are cell proteins that play an important role in **stem cell** biology.

FoxO help regulate the expression of **genes** involved in cell growth, proliferation, differentiation, insulin regulation, and **longevity.**

During aging, the removal and regeneration of **functional cells** becomes disturbed mainly due to a decrease in the **regenerative** potential of adult stem cells.

Deletion of **FoxO1/3a/4** in the bone marrow of mice leads to apoptosis (death) of **hematopoietic** stem cells. This prevents the re-population of critical **bone-marrow-derived** stem cells.

Aged mice in which **FoxO3a** was deleted display reduced **regenerative** potential[61] and depletion of the **stem cell pool.**[62]

Treatment of FoxO-deficient mice with **N-acetylcysteine** restored the **hematopoietic stem cell** compartment.

These observations correlate with the idea that decreased function of adult **stem cells** is involved in the onset of **age-related diseases.**[2]

Current evidence favorably implicates **FoxO transcription factors** in longer **human** lifespans

You can learn technical details about FoxO by searching Google: **"FoxO and aging."**

For simplicity's sake, it's good to know that boosting **NAD+** and **sirtuin** expression (with **resveratrol**) promotes favorable **FoxO** genetic transcription.

13. Ormond DR, Shannon C, Oppenheim J, et al. Stem cell therapy and curcumin synergistically enhance recovery from spinal cord injury. *PLoS One.* 2014;9(2):e88916.
14. Safaeinejad Z, Kazeminasab F, Kiani-Esfahani A, et al. Multi-effects of Resveratrol on stem cell characteristics: Effective dose, time, cell culture conditions and cell type-specific responses of stem cells to Resveratrol. *Eur J Med Chem.* 2018 Jul 15;155:651-7.
15. Safaeinejad Z, Nabiuni M, Peymani M, et al. Resveratrol promotes human embryonic stem cells self-renewal by targeting SIRT1-ERK signaling pathway. *Eur J Cell Biol.* 2017 Oct;96(7):665-72.
16. Suvorova, II, Knyazeva AR, Petukhov AV, et al. Resveratrol enhances pluripotency of mouse embryonic stem cells by activating AMPK/Ulk1 pathway. *Cell Death Discov.* 2019;5:61.
17. Dong L, Yang KQ, Fu WY, et al. Gypenosides protected the neural stem cells in the subventricular zone of neonatal rats that were prenatally exposed to ethanol. *Int J Mol Sci.* 2014 Nov 28;15(12):21967-79.
18. Igarashi M, Miura M, Williams E, et al. NAD(+) supplementation rejuvenates aged gut adult stem cells. *Aging Cell.* 2019 Jun;18(3):e12935.
19. Zhang H, Ryu D, Wu Y, et al. NAD(+) repletion improves mitochondrial and stem cell function and enhances life span in mice. *Science.* 2016 Jun 17;352(6292):1436-43.
20. Ma J, Zhang ZL, Hu XT, et al. Metformin promotes differentiation of human bone marrow derived mesenchymal stem cells into osteoblast via GSK3beta inhibition. *Eur Rev Med Pharmacol Sci.* 2018 Nov;22(22):7962-8.
21. Dadwal P, Mahmud N, Sinai L, et al. Activating Endogenous Neural Precursor Cells Using Metformin Leads to Neural Repair and Functional Recovery in a Model of Childhood Brain Injury. *Stem Cell Reports.* 2015 Aug 11;5(2):166-73.
22. Gilbert EAB, Morshead CM. Metformin Activates Neural Stem and Progenitor Cells in the Spinal Cord and Improves Functional Outcomes Following Injury. *The FASEB Journal.* 2019;33(1_supplement):208.3-.3.
23. Mihaylova MM, Sabatini DM, Yilmaz OH. Dietary and metabolic control of stem cell function in physiology and cancer. *Cell Stem Cell.* 2014 Mar 6;14(3):292-305.
24. Yuan HF, Zhai C, Yan XL, et al. SIRT1 is required for long-term growth of human mesenchymal stem cells. *J Mol Med (Berl).* 2012 Apr;90(4):389-400.
25. Chen C, Liu Y, Liu Y, et al. mTOR regulation and therapeutic rejuvenation of aging hematopoietic stem cells. *Sci Signal.* 2009 Nov 24;2(98):ra75.
26. Houtkooper RH, Pirinen E, Auwerx J. Sirtuins as regulators of metabolism and healthspan. *Nat Rev Mol Cell Biol.* 2012 Mar 7;13(4):225-38.
27. Available at: https://clinicaltrials.gov/ct2/show/NCT02942888. Accessed December 11, 2019.
28. Trammell SA, Schmidt MS, Weidemann BJ, et al. Nicotinamide riboside is uniquely and orally bioavailable in mice and humans. *Nat Commun.* 2016 Oct 10;7:12948.
29. Airhart SE, Shireman LM, Risler LJ, et al. An open-label, non-randomized study of the pharmacokinetics of the nutritional supplement nicotinamide riboside (NR) and its effects on blood NAD+ levels in healthy volunteers. *PLoS One.* 2017;12(12):e0186459.
30. Price NL, Gomes AP, Ling AJ, et al. SIRT1 is required for AMPK activation and the beneficial effects of resveratrol on mitochondrial function. *Cell Metab.* 2012 May 2;15(5):675-90.
31. Feige JN, Auwerx J. Transcriptional targets of sirtuins in the coordination of mammalian physiology. *Curr Opin Cell Biol.* 2008 Jun;20(3):303-9.
32. Papadopoli D, Boulay K, Kazak L, et al. mTOR as a central regulator of lifespan and aging. *F1000Res.* 2019;8:F1000 Faculty Rev-998.
33. Deblon N, Bourgoin L, Veyrat-Durebex C, et al. Chronic mTOR inhibition by rapamycin induces muscle insulin resistance despite weight loss in rats. *Br J Pharmacol.* 2012 Apr;165(7):2325-40.
34. Kim YC, Guan KL. mTOR: a pharmacologic target for autophagy regulation. *J Clin Invest.* 2015 Jan;125(1):25-32.
35. Burkewitz K, Zhang Y, Mair WB. AMPK at the nexus of energetics and aging. *Cell Metab.* 2014 Jul 1;20(1):10-25.
36. Viollet B, Horman S, Leclerc J, et al. AMPK inhibition in health and disease. *Crit Rev Biochem Mol Biol.* 2010 Aug;45(4):276-95.
37. Chakrabarti P, Kandror KV. The role of mTOR in lipid homeostasis and diabetes progression. *Curr Opin Endocrinol Diabetes Obes.* 2015 Oct;22(5):340-6.
38. Ho TT, Warr MR, Adelman ER, et al. Autophagy maintains the metabolism and function of young and old stem cells. *Nature.* 2017 Mar 9;543(7644):205-10.
39. Madeo F, Zimmermann A, Maiuri MC, et al. Essential role for autophagy in life span extension. *J Clin Invest.* 2015 Jan;125(1):85-93.
40. Alers S, Loffler AS, Wesselborg S, et al. Role of AMPK-mTOR-Ulk1/2 in the regulation of autophagy: cross talk, shortcuts, and feedbacks. *Mol Cell Biol.* 2012 Jan;32(1):2-11.
41. Goodman M, Liu Z, Zhu P, et al. AMPK Activators as a Drug for Diabetes, Cancer and Cardiovascular Disease. *Pharm Regul Aff.* 2014 Jul;3(2):118.
42. Canto C, Auwerx J. Calorie restriction: is AMPK a key sensor and effector? *Physiology (Bethesda).* 2011 Aug;26(4):214-24.
43. Laplante M, Sabatini DM. An emerging role of mTOR in lipid biosynthesis. *Curr Biol.* 2009 Dec 1;19(22):R1046-52.
44. Gauhar R, Hwang SL, Jeong SS, et al. Heat-processed Gynostemma pentaphyllum extract improves obesity in ob/ob mice by activating AMP-activated protein kinase. *Biotechnol Lett.* 2012 Sep;34(9):1607-16.
45. Sanguesa G, Roglans N, Baena M, et al. mTOR is a Key Protein Involved in the Metabolic Effects of Simple Sugars. *Int J Mol Sci.* 2019 Mar 5;20(5):1117.
46. Escobar KA, Cole NH, Mermier CM, et al. Autophagy and aging: Maintaining the proteome through exercise and caloric restriction. *Aging Cell.* 2019 Feb;18(1):e12876.
47. de Cabo R, Mattson MP. Effects of Intermittent Fasting on Health, Aging, and Disease. N Engl J Med. 2019 Dec 26;381(26):2541-51.
48. Ding S, Jiang J, Zhang G, et al. Resveratrol and caloric restriction prevent hepatic steatosis by regulating SIRT1-autophagy pathway and alleviating endoplasmic reticulum stress in high-fat diet-fed rats. *PLoS One.* 2017;12(8):e0183541.
49. Park SH, Huh TL, Kim SY, et al. Antiobesity effect of Gynostemma pentaphyllum extract (actiponin): a randomized, double-blind, placebo-controlled trial. *Obesity (Silver Spring).* 2014 Jan;22(1):63-71.
50. Rizza S, Muniyappa R, Iantorno M, et al. Citrus polyphenol hesperidin stimulates production of nitric oxide in endothelial cells while improving endothelial function and reducing inflammatory markers in patients with metabolic syndrome. *J Clin Endocrinol Metab.* 2011 May;96(5):E782-92.
51. Richter EA, Ruderman NB. AMPK and the biochemistry of exercise: implications for human health and disease. *Biochem J.* 2009 Mar 1;418(2):261-75.
52. Kroemer G. Autophagy: a druggable process that is deregulated in aging and human disease. *J Clin Invest.* 2015 Jan;125(1):1-4.
53. Mihaylova MM, Shaw RJ. The AMPK signalling pathway coordinates cell growth, autophagy and metabolism. *Nat Cell Biol.* 2011 Sep 2;13(9):1016-23.
54. Liu X, Hu D, Zeng Z, et al. SRT1720 promotes survival of aged human mesenchymal stem cells via FAIM: a pharmacological strategy to improve stem cell-based therapy for rat myocardial infarction. *Cell Death Dis.* 2017 Apr 6;8(4):e2731.
55. Martins R, Lithgow GJ, Link W. Long live FOXO: unraveling the role of FOXO proteins in aging and longevity. *Aging Cell.* 2016 Apr;15(2):196-207.
56. Warr MR, Binnewies M, Flach J, et al. FOXO3A directs a protective autophagy program in haematopoietic stem cells. *Nature.* 2013 Feb 21;494(7437):323-7.
57. Signer Robert AJ, Morrison Sean J. Mechanisms that Regulate Stem Cell Aging and Life Span. *Cell Stem Cell.* 2013 Feb 7;12(2):152-65.
58. Brunet A, Sweeney LB, Sturgill JF, et al. Stress-dependent regulation of FOXO transcription factors by the SIRT1 deacetylase. *Science.* 2004 Mar 26;303(5666):2011-5.
59. Mouchiroud L, Houtkooper RH, Moullan N, et al. The NAD(+)/Sirtuin Pathway Modulates Longevity through Activation of Mitochondrial UPR and FOXO Signaling. *Cell.* 2013 Jul 18;154(2):430-41.
60. Ruderman NB, Xu XJ, Nelson L, et al. AMPK and SIRT1: a long-standing partnership? *Am J Physiol Endocrinol Metab.* 2010 Apr;298(4):E751-60.
61. Miyamoto K, Araki KY, Naka K, et al. Foxo3a is essential for maintenance of the hematopoietic stem cell pool. *Cell Stem Cell.* 2007 Jun 7;1(1):101-12.
62. Tothova Z, Gilliland DG. FoxO transcription factors and stem cell homeostasis: insights from the hematopoietic system. *Cell Stem Cell.* 2007 Aug 16;1(2):140-52.

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In the News

High Saturated-Fat Diet and Fatal Prostate Cancer

A more rapid progression of prostate cancer is associated with consuming a high-fat diet and with obesity, an article published in the journal *Nature Communications* reported.*

Researchers examined how intake of dietary saturated fat by prostate cancer patients contributes to the growth of tumors and to mortality.

The scientists demonstrated that higher consumption of saturated fat mimicked an MYC overexpression, both in a mouse study and in humans. (The oncogene c-MYC plays a role in cancer initiation and progression.)

"c-MYC is a key factor in tumorigenesis, i.e. it induces malignant properties in normal cells and fuels the growth of cancer cells," said lead author Dr. David Labbé, assistant professor in the Department of Surgery, Division of Urology at McGill University.

In 319 human patients, those who had the *highest* level of saturated-fat-intake c-MYC signature were **four times** more likely to have fatal prostate cancer than men with the lowest intake.

Editor's Note: "Even after removing obesity from the equation, patients with high levels of the saturated-fat-intake MYC signature are still **three times** more likely to die of prostate cancer," Dr. Labbé said.

* *Nat Commun.* 2019 Sep 25;10(1):4358.

Dietary Supplements Can Benefit Mental Health

A meta-review of meta-analyses published in *World Psychiatry: The Official Journal of the World Psychiatric Association* found a benefit for several dietary supplements in mental health disorders.*

Researchers selected 33 meta-analyses of randomized, controlled trials that included a total of 10,951 individuals with depression, stress and anxiety disorders, bipolar disorder, personality disorder, schizophrenia, and ADHD.

The strongest evidence emerged in favor of **omega-3 fatty acid** supplementation for major depression, as an add-on treatment to antidepressant drugs. Omega-3s may also be effective in ADHD.

The review found evidence to support the use of **N-acetylcysteine** in mood disorders and schizophrenia.

5-MTHF (the bioactive form of folic acid) was beneficial as an add-on therapy for schizophrenia as well as major depression.

Editor's Note: "Future research should aim to determine which individuals might benefit most from evidence-based supplements and to better understand the underlying mechanisms so we can adopt a targeted approach to supplement use in mental health treatment," recommended senior author Jerome Sarris.

* *World Psychiatry.* 2019 Oct;18(3):308-324.

Migraines Associated with Low Vitamin B12

Among individuals who suffer from migraine headache, there is a greater risk of low levels of vitamin B12, and higher levels of methylmalonic acid (which is increased with B12 deficiency) according to a study published in the journal *Headache*.*

The study compared 70 men and women who experienced chronic or episodic migraines, to 70 healthy adults who did not have the condition. Fasting blood samples were analyzed for serum vitamin B12 and methylmalonic acid levels.

While the healthy group had **vitamin B12** levels that averaged **667 pg/mL** (picograms per milliliter), levels among migraine patients averaged **512 pg/mL**.

As expected, methylmalonic acid levels (which are increased with B12 deficiency) were lower in the healthy group than in the migraine group.

Those whose vitamin B12 levels were among the top **25%** of participants had an **80%** decrease in the odds of having migraine compared to participants whose levels were among the lowest **25%**.

Editor's Note: The authors discuss the hypothesis that elevated **levels of homocysteine** could provoke migraine and suggest that vitamin B12's involvement in the regulation of homocysteine may help support the association revealed by this study.

* *Headache.* 2019 Oct;59(9):1492-1503.

37% Lower Risk of Mild Cognitive Impairment with Higher Magnesium Intake

A study of 6,473 women in the U.S., aged 65-79, found that those who consumed magnesium in amounts between **257.3 mg/day** and **317.8 mg/day** lowered their risk of developing mild cognitive impairment by **37%**, compared to those who consumed less than **197 mg/day**.*

The study, published in *BMJ Open*, looked at the intake of dietary and supplemental magnesium in postmenopausal women who were participants in the Women's Health Initiative Memory Study (WHIMS) and who did not have dementia when they enrolled.

Magnesium consumption was compared with cognitive outcomes. Mild cognitive impairment was defined as being not enough to interfere with everyday activities.

The authors concluded that:

"Total magnesium intake between the estimated average requirement and the recommended dietary allowances may associate with a lower risk of mild cognitive impairment and/or probable dementia."

Editor's Note: While the recommended daily allowance of magnesium is **420 mg/day** for men and **320 mg/day** for women, **Life Extension®** and many health experts now advise that adults consume at least **500 mg** each day.

* *BMJ Open.* 2019 Nov 3;9(11):e030052.

Restricting Eating to a 10-Hour Window Can Improve Cardiometabolic Health

Time-restricted eating, a type of intermittent fasting, promoted significant health benefits in patients with metabolic syndrome, a pilot study published in the journal *Cell Metabolism* reported.*

The study suggests that eating only within a 10-hour window, and not eating for a 14-hour stretch of time, can benefit individuals at risk for type II diabetes, heart disease, and stroke.

A research team from the University of California, San Diego, and The Salk Institute for Biological Studies, enrolled 19 participants, 13 men and six women, who had been diagnosed with metabolic syndrome. For a 12-week period, their eating was restricted to a maximum of 10-hours daily, during which time they could eat anything they wanted, in whatever quantities they wished.

At baseline, the participants' eating window, defined as the interval during which **95%** of calories were consumed, was about 15 hours every day.

At the end of the study, the **29%** reduction in the eating interval to 10 hours daily, was associated with a **3%** reduction in weight, BMI, and percent of body fat, and a **4%** reduction in waist circumference. Individuals also reported that they had more restful sleep. Many also saw lower cholesterol and blood sugar levels.

Editor's Note: "Time-restricted eating is a potentially powerful lifestyle intervention that can be added to standard medical practice to treat metabolic syndrome," the authors stated.

*https://doi.org/10.1016/j.cmet.2019.11.004.

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3. **Cyanidin-3-glucoside** to assist with night vision.[6-8]
4. **Astaxanthin** for comprehensive eye health support and to fight eye fatigue.[9]
5. **Saffron** to help support vision, based on study subjects seeing an average of two additional lines on eye chart used by doctors to test vision.[1]

References

1. *JAMA Ophthalmol.* 2015;133(12):1415-24.
2. *Nutrients.* 2013 April;5(4):1169-85.
3. *Nutrition*. 2011 Sep;27(9):960-6.
4. *Free Radic Biol Med.* 2012;53(6):1298-307.
5. *J Ophthalmol.* 2015;2015:523027.
6. *Evid Based Complement Alternat Med.* 2012;2012:429124.
7. *Invest Ophthalmol Vis Sci.* 2010;51(12):6118-24.
8. *J Agric Food Chem. 2003* Jun 4;51(12):3560-3.
9. *Altern Med Rev.* 2011 Dec;16(4):355-64.

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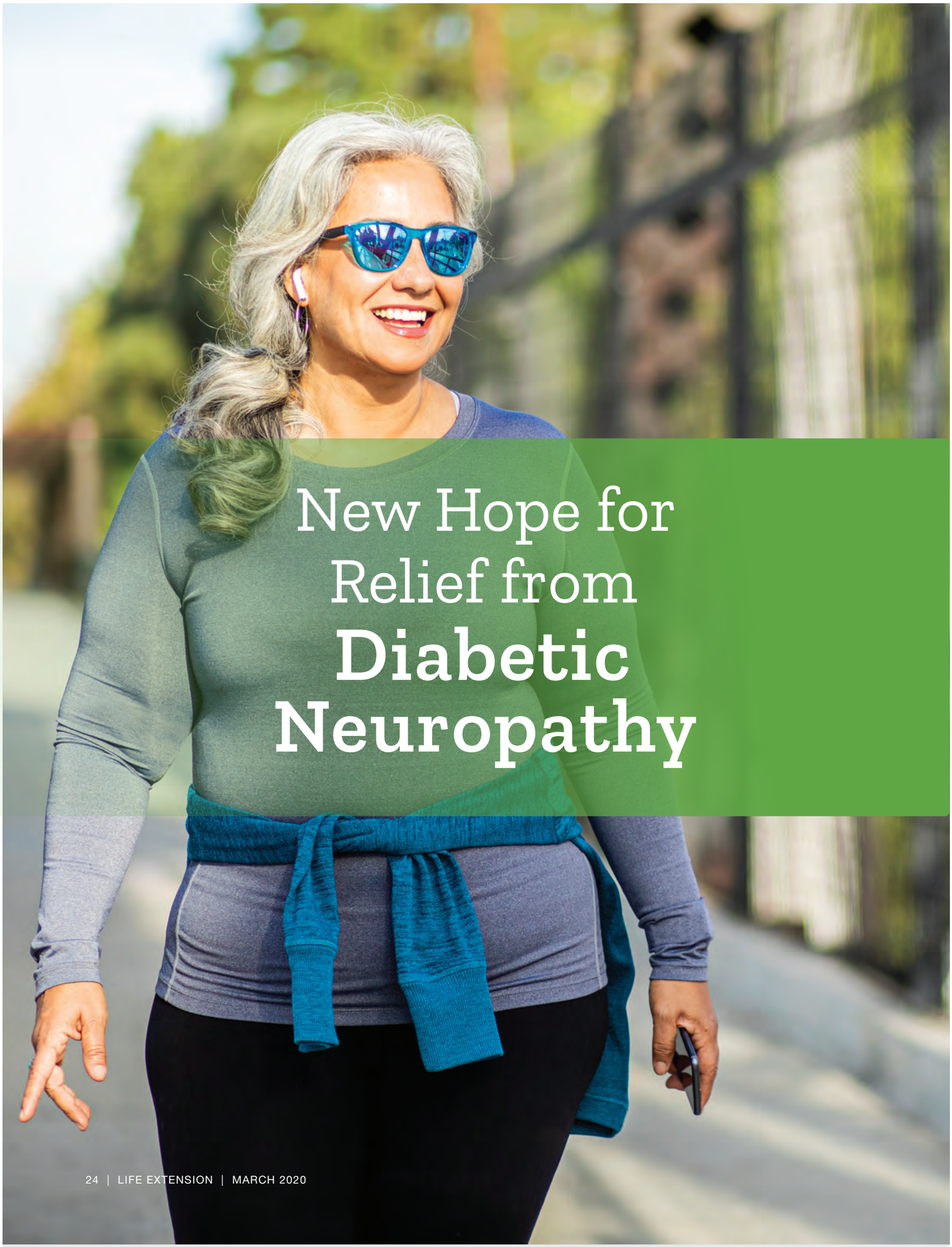

New Hope for Relief from **Diabetic Neuropathy**

BY STEPHANIE CLARKSON

It's one of the most common complications of **diabetes**:

Nerve damage known as **diabetic neuropathy**.[1]

About **30%** to **50%** of individuals with **type II diabetes** will develop this debilitating condition, often in the legs and feet.[2]

Diabetic neuropathy frequently causes severe pain and loss of mobility. When the condition worsens, it can lead to amputation and even fatal infections.[3,4]

By the time symptoms arise, the nerve damage has already progressed and become severe–and very difficult to fully repair.

That makes it *crucial* for diabetics to take *aggressive* measures to prevent the *horrors* of diabetic neuropathy.

Managing this disorder is challenging. Damage can continue even if sugar levels are under control,[2,5,6] and no drug can reliably stop the nerve damage from getting worse.[5]

Increasing evidence has identified **seven nutrients** that may provide relief from **symptoms** and **protect** against the development of diabetes-induced neuropathy.[7-23] They are:

- Omega-3 fatty acids
- Vitamin D
- Curcumin
- Lipoic acid
- Folic acid
- Acetyl-L-carnitine
- Benfotiamine

Working in overlapping ways, each of these compounds protects tiny nerves through important mechanistic pathways.

What *Is* Diabetic Neuropathy?

Diabetic neuropathy occurs when prolonged elevation of blood sugar levels damages tiny capillaries feeding blood to nerve fibers.

As nerves shrivel and die from lack of blood flow, there is a loss of nerve function, loss of sensation in affected areas, and progressive manifestation of pain and immobility.

There are several types of diabetic neuropathy, categorized by which nerves are affected.

Diabetic neuropathy occurs in both type I and type II diabetes, and about **40%** to **70%** of diabetics will develop the condition.[24-28]

Symptoms depend on the type of neuropathy and which nerves are affected. Usually the symptoms develop gradually, and can include severe pain, numbness or tingling of extremities, balance problems, erectile dysfunction, and more.[29]

Published research indicates how **seven nutrients** can offer relief of symptoms and even slow the processes that lead to nerve dysfunction.[7-23]

Omega-3 Fatty Acids

Fish and flaxseed oils are rich in anti-inflammatory **omega-3 fatty acids**.

Increasing intake of omega-3s shows great promise in preventing and relieving diabetic neuropathy. In rodent studies, **fish oil** can slow and even ***reverse the progression*** of diabetic nerve damage.[22,23]

Here are some critical ways in which omega-3s may help treat diabetic neuropathy:

- People with diabetic neuropathy suffer from a decrease in **nerve conduction velocity**, which measures how fast an electrical impulse moves through the nerves. In animals, fish oil rapidly restores **nerve conduction velocity** *and* reduces visible damage to crucial nerve bundles.[30]
- Pain and hypersensitivity to touch are *reduced* in diabetic animals after treatment with fish oil.[31]
- Nerve clusters from fish-oil-treated animals show a *reduction* in inflammation, and lower levels of the "master inflammation promoter" nuclear factor kappa B (NF-kB).[31]
- After treatment with DHA or EPA, nerve cells in lab cultures sharply ramp up their production of proteins that fight harmful oxidative stress.[32]

The above differing actions have major consequences. In a study of people with **diabetic foot ulcers**, complications of neuropathy that can lead to amputation, taking **one gram** per day of omega-3 significantly decreased ulcer size.

At the same time, markers of inflammation were lower and total antioxidant levels rose significantly.[33]

WHAT YOU NEED TO KNOW

Nutrients Help Protect Against Nerve Damage

- **Diabetic neuropathy**, nerve damage caused by high blood sugar from diabetes, affects up to half of all people with **type II diabetes**.
- This nerve damage can cause severe pain and loss of mobility and can lead to deadly infections and the risk of amputation.
- No existing drug can reverse the course of this disease. But **seven** nutrients may slow the events leading to diabetic neuropathy.
- Anyone with type II diabetes, pre-diabetes, or impaired glucose tolerance could benefit from increasing the intake of these nutrients.

Vitamin D

Vitamin D is best known for its role in building strong bones. But it also has an important impact on brain and nerve tissue.[34,35]

Numerous studies have established that vitamin D *deficiency* (levels less than **20 ng/mL**) and *insufficiency* (**20 ng/mL** to **30 ng/mL**) are strongly associated with neuropathy in diabetics.[1,36-38]

One study found that diabetics with deficient vitamin D levels have **two-fold greater** odds of neuropathy.[37]

Clinical trials have established that **50,000 IU** of vitamin **D3 weekly** significantly reduces symptoms of diabetic nerve damage and improves quality of life.[18,19]

And in one study, **50,000 IU** of vitamin D given every two weeks significantly reduced the size of diabetic foot ulcers after 12 weeks.[39]

Curcumin

Curcumin is prized for its anti-inflammatory properties and has recently been studied for its potential in **pain control**.[40,41]

In fact, curcumin has been shown to significantly *raise* the pain threshold and *reduce* pain hypersensitivity in lab animals.[41-44]

For people suffering from diabetic nerve damage, curcumin offers much more than pain relief. The compound, found in the spice **turmeric**, may also *slow* or *reverse* some of the processes that produce neuropathic pain in the first place.

Pre-clinical studies show that curcumin:

- *Reduces* production of **TNF-alpha**, an inflammatory protein and contributor to pain,[43]
- *Activates* the internal pain-relief system (known as the **endogenous opioid system**),[41]
- *Inhibits* oxidative stress in cells, which is a major trigger of nerve pain,[44] and
- *Reduces* aberrant electrical impulses in diabetic nerves.[45,46]

Lipoic Acid

A number of human studies show that in diabetes patients with painful nerve damage, **600 mg daily** of alpha-lipoic acid produces significant improvements in:[14-17]

- Pain,
- Burning,
- Numbness,
- Ability to feel pin pricks and touch pressure,
- Ankle reflexes,
- Muscle weakness,
- Need for "rescue" pain medications,
- Quality of life scores, and
- Reports of overall health status.

At the same dose, alpha-lipoic acid also prevents worsening of impairment caused by neuropathy.[15]

Folic Acid

Folic acid is a B vitamin that *lowers* levels of **homocysteine**,[47] an amino acid that is linked to the development of cardiovascular disease and is dangerously toxic to nerves.[48]

In a 2001 study involving 65 patients with type II diabetes, the risk of nerve damage more than *doubled* with each **5 mmol/L** increase in homocysteine.[49]

Chinese patients who have **type II diabetes** with neuropathy also have significantly *lower* levels of folate than those without neuropathy.[50]

A recent study of patients with diabetic neuropathy showed that **1,000 mcg** of **folic acid** given daily for 16 weeks, *lowered* homocysteine levels, and markedly *increased* nerve conduction velocity and signal strength.[13]

An animal study found that folic acid treatment could protect against neuropathy by increasing **nerve growth factor**, a protein essential for promoting nerve healing.[51]

Acetyl-L-Carnitine

Acetyl-L-carnitine is a form of the amino acid L-carnitine that has shown to have neuroprotective and analgesic effects in the peripheral nervous system.[52]

Acetyl-L-carnitine works in multiple ways to protect nerves, including:[53]

- Reducing harm from oxidative stress and helping to prevent nerve cell death,
- Relieving pain by reducing the concentration of the pain-signaling neurotransmitter glutamate at the synapses,
- Facilitating nerve regeneration and nerve damage repair,
- Promoting the health of nerve cell membranes, and
- Amplifying responses to nerve growth factor.

In people with diabetes, acetyl-L-carnitine at doses of **1,500 mg/day** to **3,000 mg/day** improves nerve conduction velocity and strength, reduces pain and disability scores, increases numbers of nerve fibers, and regenerates damaged nerve fibers.[10-12]

Benfotiamine

Benfotiamine is the fat-soluble form of thiamine (vitamin B1).

One key factor involved in the development and progression of diabetic neuropathy is increased **glycation**, a process in which glucose and other sugars interact with proteins.

Glycation is a process in which glucose and other sugars bind irreversibly to proteins, lipids and nucleic acids, causing them to become dysfunctional. The dysfunctional molecules created by glycation are known as **advanced glycation end products** (AGEs).[54-56]

AGEs damage nerves by inhibiting their function, which in turn affects their activity, and by triggering an inflammatory response that further damages nerve cells.[57]

Studies have shown that benfotiamine reduces pain and restores normal sensation in patients suffering from diabetic neuropathy.[7-9]

The best results have been seen with doses ranging from **320 mg** to **600 mg** daily, for periods as short as three weeks, though benefits steadily increased with longer treatment duration.[7-9]

Summary

Diabetic neuropathy—nerve damage resulting from diabetes—can lead to severe pain, numbness, loss of function, and even limb amputation.

No drug can reliably stop or reverse the progression of diabetic neuropathy.

Seven nutrients may be capable of slowing the progression of diabetic neuropathy.

They work in many ways, offering a broad range of protection against this debilitating ailment. •

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

References

1. Alamdari A, Mozafari R, Tafakhori A, et al. An inverse association between serum vitamin D levels with the presence and severity of impaired nerve conduction velocity and large fiber peripheral neuropathy in diabetic subjects. *Neurol Sci.* 2015 Jul;36(7):1121-6.
2. Richner M, Ferreira N, Dudele A, et al. Functional and Structural Changes of the Blood-Nerve-Barrier in Diabetic Neuropathy. *Front Neurosci*. 2018;12:1038.
3. Dewanjee S, Das S, Das AK, et al. Molecular mechanism of diabetic neuropathy and its pharmacotherapeutic targets. *Eur J Pharmacol*. 2018 Aug 15;833:472-523.

4. Miranda-Massari JR, Gonzalez MJ, Jimenez FJ, et al. Metabolic correction in the management of diabetic peripheral neuropathy: improving clinical results beyond symptom control. *Curr Clin Pharmacol.* 2011 Nov;6(4):260-73.
5. Nawroth PP, Bendszus M, Pham M, et al. The Quest for more Research on Painful Diabetic Neuropathy. *Neuroscience*. 2018 Sep 1;387:28-37.
6. Feldman EL, Callaghan BC, Pop-Busui R, et al. Diabetic neuropathy. *Nat Rev Dis Primers*. 2019 Jun 13;5(1):41.
7. Stracke H, Gaus W, Achenbach U, et al. Benfotiamine in diabetic polyneuropathy (BENDIP): results of a randomised, double blind, placebo-controlled clinical study. *Exp Clin Endocrinol Diabetes*. 2008 Nov;116(10):600-5.
8. Haupt E, Ledermann H, Kopcke W. Benfotiamine in the treatment of diabetic polyneuropathy--a three-week randomized, controlled pilot study (BEDIP study). *Int J Clin Pharmacol Ther*. 2005 Feb;43(2):71-7.
9. Winkler G, Pal B, Nagybeganyi E, et al. Effectiveness of different benfotiamine dosage regimens in the treatment of painful diabetic neuropathy. *Arzneimittelforschung.* 1999 Mar;49(3):220-4.
10. De Grandis D, Minardi C. Acetyl-L-carnitine (levacecarnine) in the treatment of diabetic neuropathy. A long-term, randomised, double-blind, placebo-controlled study. *Drugs R D.* 2002;3(4):223-31.
11. Sima AA, Calvani M, Mehra M, et al. Acetyl-L-carnitine improves pain, nerve regeneration, and vibratory perception in patients with chronic diabetic neuropathy: an analysis of two randomized placebo-controlled trials. *Diabetes Care.* 2005 Jan;28(1):89-94.
12. Li S, Chen X, Li Q, et al. Effects of acetyl-L-carnitine and methylcobalamin for diabetic peripheral neuropathy: A multicenter, randomized, double-blind, controlled trial. *J Diabetes Investig*. 2016 Sep;7(5):777-85.

13. Mottaghi T, Khorvash F, Maracy M, et al. Effect of folic acid supplementation on nerve conduction velocity in diabetic polyneuropathy patients. *Neurol Res.* 2019 Apr;41(4):364-8.
14. Ziegler D, Nowak H, Kempler P, et al. Treatment of symptomatic diabetic polyneuropathy with the antioxidant alpha-lipoic acid: a meta-analysis. *Diabet Med.* 2004 Feb;21(2):114-21.
15. Ziegler D, Low PA, Litchy WJ, et al. Efficacy and safety of antioxidant treatment with alpha-lipoic acid over 4 years in diabetic polyneuropathy: the NATHAN 1 trial. *Diabetes Care.* 2011 Sep;34(9):2054-60.
16. Garcia-Alcala H, Santos Vichido CI, Islas Macedo S, et al. Treatment with alpha-Lipoic Acid over 16 Weeks in Type 2 Diabetic Patients with Symptomatic Polyneuropathy Who Responded to Initial 4-Week High-Dose Loading. *J Diabetes Res*. 2015;2015:189857.
17. Agathos E, Tentolouris A, Eleftheriadou I, et al. Effect of alpha-lipoic acid on symptoms and quality of life in patients with painful diabetic neuropathy. *J Int Med Res.* 2018 May;46(5):1779-90.
18. Ghadiri-Anari A, Mozafari Z, Gholami S, et al. Dose vitamin D supplementations improve peripheral diabetic neuropathy? A before-after clinical trial. *Diabetes Metab Syndr.* 2019 Jan - Feb;13(1):890-3.
19. Shehab D, Al-Jarallah K, Abdella N, et al. Prospective evaluation of the effect of short-term oral vitamin d supplementation on peripheral neuropathy in type 2 diabetes mellitus. *Med Princ Pract.* 2015;24(3):250-6.
20. Oh YS. Bioactive Compounds and Their Neuroprotective Effects in Diabetic Complications. *Nutrients*. 2016 Jul 30;8(8).
21. Zilliox LA, Russell JW. Physical activity and dietary interventions in diabetic neuropathy: a systematic review. *Clin Auton Res*. 2019 Aug;29(4):443-55.
22. Yorek MA. Is Fish Oil a Potential Treatment for Diabetic Peripheral Neuropathy? *Curr Diabetes Rev.* 2018;14(4):339-49.
23. Yorek MA. The Potential Role of Fatty Acids in Treating Diabetic Neuropathy. *Curr Diab Rep.* 2018 Aug 25;18(10):86.
24. Yagihashi S, Yamagishi S, Wada R. Pathology and pathogenetic mechanisms of diabetic neuropathy: correlation with clinical signs and symptoms. *Diabetes Res Clin Pract*. 2007 Sep;77 Suppl 1:S184-9.
25. Available at: https://www.uptodate.com/contents/epidemiology-and-classification-of-diabetic-neuropathy. Accessed December 12, 2019.
26. Boulton AJ. Diabetic neuropathy: is pain God's greatest gift to mankind? *Semin Vasc Surg*. 2012 Jun;25(2):61-5.
27. Callaghan BC, Cheng HT, Stables CL, et al. Diabetic neuropathy: clinical manifestations and current treatments. *Lancet Neurol*. 2012 Jun;11(6):521-34.
28. Available at: https://www.niddk.nih.gov/health-information/diabetes/overview/preventing-problems/nerve-damage-diabetic-neuropathies. Accessed December 12, 2019.
29. Available at: https://www.mayoclinic.org/diseases-conditions/diabetic-neuropathy/symptoms-causes/syc-20371580. Accessed December 3, 2019.
30. Gerbi A, Maixent JM, Ansaldi JL, et al. Fish oil supplementation prevents diabetes-induced nerve conduction velocity and neuroanatomical changes in rats. *J Nutr.* 1999 Jan;129(1):207-13.
31. Li MY, Wang YY, Cao R, et al. Dietary fish oil inhibits mechanical allodynia and thermal hyperalgesia in diabetic rats by blocking nuclear factor-kappaB-mediated inflammatory pathways. *J Nutr Biochem.* 2015 Nov;26(11):1147-55.
32. Tatsumi Y, Kato A, Sango K, et al. Omega-3 polyunsaturated fatty acids exert anti-oxidant effects through the nuclear factor (erythroid-derived 2)-related factor 2 pathway in immortalized mouse Schwann cells. *J Diabetes Investig.* 2019 May;10(3):602-12.
33. Soleimani Z, Hashemdokht F, Bahmani F, et al. Clinical and metabolic response to flaxseed oil omega-3 fatty acids supplementation in patients with diabetic foot ulcer: A randomized, double-blind, placebo-controlled trial. *J Diabetes Complications.* 2017 Sep;31(9):1394-400.
34. Groves NJ, McGrath JJ, Burne TH. Vitamin D as a neurosteroid affecting the developing and adult brain. *Annu Rev Nutr.* 2014;34:117-41.
35. Harms LR, Burne TH, Eyles DW, et al. Vitamin D and the brain. *Best Pract Res Clin Endocrinol Metab*. 2011 Aug;25(4):657-69.
36. Soderstrom LH, Johnson SP, Diaz VA, et al. Association between vitamin D and diabetic neuropathy in a nationally representative sample: results from 2001-2004 NHANES. *Diabet Med.* 2012 Jan;29(1):50-5.
37. Esteghamati A, Fotouhi A, Faghihi-Kashani S, et al. Non-linear contribution of serum vitamin D to symptomatic diabetic neuropathy: A case-control study. Diabetes Res Clin Pract. 2016 Jan;111:44-50.
38. Shillo P, Selvarajah D, Greig M, et al. Reduced vitamin D levels in painful diabetic peripheral neuropathy. *Diabet Med.* 2019 Jan;36(1):44-51.
39. Razzaghi R, Pourbagheri H, Momen-Heravi M, et al. The effects of vitamin D supplementation on wound healing and metabolic status in patients with diabetic foot ulcer: A randomized, double-blind, placebo-controlled trial. *J Diabetes Complications*. 2017 Apr;31(4):766-72.
40. Sun J, Chen F, Braun C, et al. Role of curcumin in the management of pathological pain. Phytomedicine. 2018 Sep 15;48:129-40.
41. Banafshe HR, Hamidi GA, Noureddini M, et al. Effect of curcumin on diabetic peripheral neuropathic pain: possible involvement of opioid system. *Eur J Pharmacol.* 2014 Jan 15;723:202-6.
42. Attia HN, Al-Rasheed NM, Al-Rasheed NM, et al. Protective effects of combined therapy of gliclazide with curcumin in experimental diabetic neuropathy in rats. *Behav Pharmacol.* 2012 Apr;23(2):153-61.
43. Li Y, Zhang Y, Liu DB, et al. Curcumin attenuates diabetic neuropathic pain by downregulating TNF-alpha in a rat model. *Int J Med Sci.* 2013;10(4):377-81.
44. Zhao WC, Zhang B, Liao MJ, et al. Curcumin ameliorated diabetic neuropathy partially by inhibition of NADPH oxidase mediating oxidative stress in the spinal cord. *Neurosci Lett*. 2014 Feb 7;560:81-5.
45. Meng B, Shen LL, Shi XT, et al. Effects of curcumin on TTX-R sodium currents of dorsal root ganglion neurons in type 2 diabetic rats with diabetic neuropathic pain. *Neurosci Lett.* 2015 Sep 25;605:59-64.
46. Meng B, Shen LL, Shi XT, et al. Effects of curcumin on sodium currents of dorsal root ganglion neurons in type 2 diabetic neuropathic pain rats. *Zhongguo Ying Yong Sheng Li Xue Za Zhi*. 2015 Nov;31(6):541-8.
47. Scaglione F, Panzavolta G. Folate, folic acid and 5-methyltetrahydrofolate are not the same thing. *Xenobiotica.* 2014 May;44(5):480-8.
48. Bhatia P, Singh N. Homocysteine excess: delineating the possible mechanism of neurotoxicity and depression. *Fundam Clin Pharmacol.* 2015 Dec;29(6):522-8.
49. Ambrosch A, Dierkes J, Lobmann R, et al. Relation between homocysteinaemia and diabetic neuropathy in patients with Type 2 diabetes mellitus. *Diabet Med.* 2001 Mar;18(3):185-92.
50. Wang D, Zhai JX, Liu DW. Serum folate, vitamin B12 levels and diabetic peripheral neuropathy in type 2 diabetes: A meta-analysis. *Mol Cell Endocrinol.* 2017 Mar 5;443:72-9.
51. Yilmaz M, Aktug H, Oltulu F, et al. Neuroprotective effects of folic acid on experimental diabetic peripheral neuropathy. T*oxicol Ind Health*. 2016 May;32(5):832-40.
52. Onofrj M, Ciccocioppo F, Varanese S, et al. Acetyl-L-carnitine: from a biological curiosity to a drug for the peripheral nervous system and beyond. *Expert Rev Neurother.* 2013 Aug;13(8):925-36.
53. Sergi G, Pizzato S, Piovesan F, et al. Effects of acetyl-L-carnitine in diabetic neuropathy and other geriatric disorders. *Aging Clin Exp Res*. 2018 Feb;30(2):133-8.
54. Ahmed N, Thornalley PJ. Advanced glycation endproducts: what is their relevance to diabetic complications? *Diabetes Obes Metab.* 2007 May;9(3):233-45.
55. Sugimoto K, Yasujima M, Yagihashi S. Role of advanced glycation end products in diabetic neuropathy. *Curr Pharm Des.* 2008;14(10):953-61.
56. Fournet M, Bonte F, Desmouliere A. Glycation Damage: A Possible Hub for Major Pathophysiological Disorders and Aging. *Aging Dis.* 2018 Oct;9(5):880-900.
57. Vincent AM, Callaghan BC, Smith AL, et al. Diabetic neuropathy: cellular mechanisms as therapeutic targets. *Nat Rev Neurol*. 2011 Sep 13;7(10):573-83.

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Age Reversal UPDATE

BY WILLIAM FALOON

Each year I dedicate enormous time to a scientific conference titled **Revolution Against Aging and Death**.

The abbreviation for this event is "**RAADfest**."

It is presented by a charitable group called the **Coalition for Radical Life Extension**.

The inspiration for **RAADfest** occurred in **2015**, as a confluence of biomedical advances made clear that it may be possible to turn **degenerative aging** into a manageable condition in our lifetime.

Findings from small **human** studies that I help organize and fund, show improvements in **clinical measures** (such as blood pressure and joint function) and **aging biomarkers** (such as DNA health and inflammatory indicators).

I've self-experimented with many of these **age reversal** interventions.

So far, objective measures indicate that I may be growing **biologically younger**. The same may be true of most of the volunteers who participated in the proof-of-concept clinical trials.

The results of these studies are so impressive that a new charity was established in **2019** to fund a human **age reversal** trial that is unparalleled in the history of medical science.

The objective of this study is to carefully measure the effects of a **combination** of regenerative approaches that include:

1. **AMPK** activation,
2. Removal of **senescent cells** (using senolytics),
3. Suppression of excess **mTOR**,
4. Restoration of **NAD+**,
5. Additional approaches being explored now.

This article will summarize a few of the major announcements made at **RAADfest 2019**. These include published results from a clinical trial that resulted in an unprecedented **2.5-year** average **reversal** of biological **age** as measured by epigenetic aging clocks!

None of this would be possible without your purchases of **Life Extension®** nutrient formulas and laboratory tests.

Proceeds from these sales support scientific endeavors that have little or no commercial value but may enable substantive increases in **healthy longevity** to benefit all of humanity.

RAADfest 2019 may go down in the history books as a major inflection point in our battle against and victory over degenerative aging.

More than **260 people** enrolled in a new project called the **Vitality in Aging Longitudinal Study**. This represented **25%** of the **1,000** or so RAADfest 2019 attendees!

Even more would have enrolled if the Vitality in Aging research group had the time to expand its staff to accommodate the tremendous interest shown.

People had to be turned away from the clinic established in the hotel because the resources were not sufficient to enroll everyone who was eager to join.

The **Vitality in Aging Longitudinal Study** will enable meticulous **measures** of **regenerative interventions**, including the stair-step approach to **biological age control** outlined below.

Many more are expected to enroll as new clinical study sites open throughout the United States and beyond.

Human Age Reversal Demonstrated!

Unparalleled results from a published clinical trial were presented at **RAADfest 2019**.

The findings reveal a **2.5-year** reversal in **biological age** markers in healthy men aged 51-65!

This study was conducted by Dr. Greg Fahy's **Intervene Immune** group in collaboration with researchers from **Stanford University** and **UCLA**. This one-year treatment protocol showed:[1]

1. Regenerated **thymic** structure,
2. Improved **immune function** with signs of increased cancer protection,
3. Improved **prostate cancer** markers (PSA and percent free PSA),
4. Regenerative effects on **kidney function** and **bone marrow**, and
5. **2.5 years** of **age reversal**, on average, as measured by four different **DNA methylation** tests.

Biological age was assessed by multiple epigenetic aging clocks. **Dr. Steve Horvath** from **UCLA**, the original developer of this technology, who is considered to be the world's foremost expert in its use, was one of the investigators in this trial.

Measurement of **DNA methylation patterns** may be the most accurate **biomarker** test to assess **biological age** and can be a strong predictor of future healthspan and lifespan.

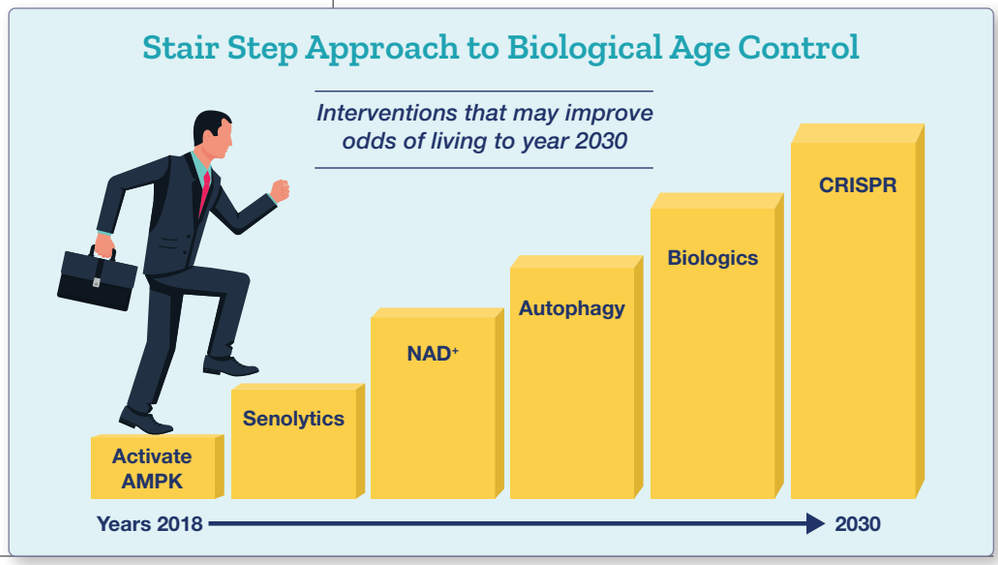
The interventions used by Dr. Fahy's group were individualized doses of **metformin**, **DHEA**, and **human growth hormone**.

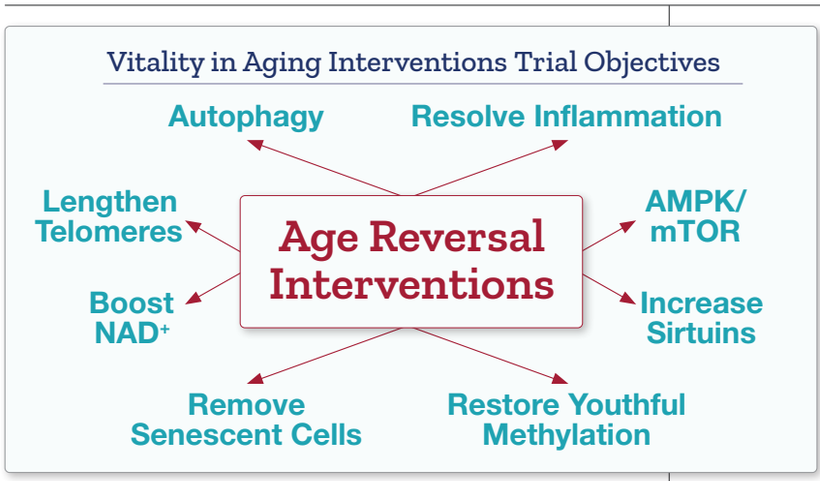
The rationale for the study is that **growth hormone** is known to regenerate the **thymus gland**, which is vital for youthful **immune** responses. Downsides to growth hormone are **insulin resistance** and a potential to stimulate proliferation of malignant cells, but both problems were apparently contained by the protocol employed.

By combining **metformin** and **DHEA** with **growth hormone** for just one year, the benefits of growth hormone (such as systemic tissue regeneration) occurred with no significant side effects and the unexpected side benefit of an average of **2.5 years** of biological **age reversal** as measured by DNA methylation clocks.

Before and after **MRI** tests validated the **regeneration** of **thymic** structure. (These MRI scans were funded in part by our **Life Extension®** group.)

And breaking news I just learned is that the study subjects that demonstrated **2.5 years** of age-reversal continue to demonstrate **rejuvenating** signs *after* the one year of low-dose **growth hormone** was discontinued.





Many of you already take **DHEA** as well as **AMPK-activating** compounds like **metformin** or AMPK-activating nutrients like ***Gynostemma pentaphyllum***.

Dr. Fahy's group at **Intervene Immune** is now launching an expanded study of this longevity protocol in Southern California and exploring ways to make treatment widely available and affordable. Additional information about their work appears on page 65 of this month's issue.

My goal is to enable readers of ***Life Extension®*** **magazine** to gain access to this new age reversal intervention at ultra-low pricing as part of a large new study group managed by **Intervene Immune.**

Other potential longevity approaches were introduced at **RAADfest 2019**.

The **Vitality in Aging Longitudinal Study** looks forward to measuring the efficacy of these interventions and reporting the results to rapidly advance the science.

New Human Rejuvenation Trial

Those who enrolled in the **Vitality in Aging Longitudinal Study** are being carefully screened to meet eligibility criteria to enroll in the:

Vitality in Aging Interventions Trial

This **clinical trial** aims to induce statistically significant and meaningful **age reversal** in only **12 months**. It will entail very close physician oversight and precise, careful introduction of the regenerative interventions.

Funding has been secured to study 40-50 people using **multiple** therapies and in-depth biomarkers to ascertain the degree of **age reversal** that may be occurring.

The interventions that will be introduced are represented by the first four steps in the image on the facing page to the left. Later **Vitality in Aging** studies will include newer interventions as cutting-edge research continues to provide more healthy longevity options.

New Donations Received

Right before my keynote RAADfest presentation, one of our supporters let me know that he was not happy about the progress made with a new charity I established called the **Human Age Reversal Project**.

Specifically, his concern was that as of October 1, 2019, we had only raised **$395,000**.

He made a new donation of more than **$200,000**. This, along with other donations received to date, brings our total to more than **$675,000**.

All **Human Age Reversal Project** donations are placed in an interest-bearing brokerage account. I expect this to grow much ***higher*** as more people understand the ramifications of this research for themselves and all of humanity.

I provided **hundreds of thousands of dollars** to launch the **Vitality in Aging Longitudinal Study** in **2019** and will continue to support it.

For the **Vitality in Aging Interventions Trial**, we will need new donations to expand beyond the first 15 months.

I ask that you help support the **Human Age Reversal Project**. We are accelerating age reversal initiatives and every penny goes towards the research; there are no salaries or fixed overhead costs!

Donation information is in the box below:

Charity to fund research
with tax-deductible donations:

Human Age Reversal Project

Make checks payable to:

Human Age Reversal Project
300 NE 20th Street, #409
Boca Raton, FL 33431

or donate online:

age-reversal.net/donate

The Medical Clinic at RAADfest

The medical clinic set up at RAADfest was filled with people seeking to enroll in the **Vitality in Aging (VIA) Longitudinal Study**.

Many who wanted to join could not because the lines were too long.

While huge resources were spent to open the **Vitality in Aging Longitudinal Study** clinic, the staff was unable to handle the unexpectedly large response.

Another temporary enrollment center was set up in Phoenix, Arizona, in November 2019 so that some of those who want to join this study could do so.

The Vitality in Aging research group spent three months after **RAADfest 2019** processing applications, baseline clinical data, the many different blood samples taken, and enrolling more study subjects.

From the group of over 300 enrollees in the **Vitality in Aging Longitudinal Study**, an initial 40-50 will be selected who meet the eligibility criteria to qualify for the Vitality in Aging **Interventions** Study.

Just to clarify, before it can be determined if you meet the eligibility criteria to join the **Vitality in Aging Interventions Study**, you first need to enroll in the **Vitality in Aging Longitudinal Study** so your data can be collected and analyzed.

My RAADfest keynote talk introduced and explained the differences between these two human age reversal studies.

To view my 55-minute presentation (with new slides added), log on to the home page of the **Age Reversal Network:** www.age-reversal.net

Bill Faloon speaking at RAADFest

RAADfest 2019 Update on Age Reversal with Bill Faloon

How to Enroll in the Longitudinal Study

The **Vitality in Aging Longitudinal Study** is modeled after the famous **Framingham Heart Study** that enabled scientists to identify risk factors that cause heart attack and stroke.

Copied in these pages are **Power Point** slides I used at **RAADfest** to describe the **Framingham Heart Study** and how many lives were saved.

The plan is to rapidly identify **risk factors** that cause accelerated **aging** and what lifestyles and **interventions** (such as **senolytic** therapy) can reverse aging biomarkers.

Vitality in Aging Longitudinal Study sites are expected to open in most major cities. This will provide convenient access to people interested in joining a team effort to defeat aging.

The goal is to have qualified **volunteer doctors** in most major metropolitan areas, or you can travel to one of the study sites expected to open in Southern California, South Florida, Las Vegas, and Idaho.

The first step for those interested in participating in either of these studies is to have an **Age Management Blood Test Panel**. The results enable the research group and you to determine if you best qualify for either:

Vitality in Aging Longitudinal Study

or

Vitality in Aging Interventions Trial

The retail price of the individual tests included in this new **Age Management Blood Test Panel** is around **$3,000**.

It is being made available for a limited time for **$495**, which includes your registration in the **Vitality in Aging Longitudinal Study**.

For those who utilize the **Male** or **Female Blood Test Panels** from **LifeExtension®**, the new **Age Management Panel** can be used to take its place with many more tests included.

The individual tests in the new **Age Management Blood Test Panel** can be viewed on the next page.

To order this blood test and enroll in the Vitality in Aging **Longitudinal Study** electronically, please log on to: VitalityInAging.org/sign-up

If you don't want this blood test now, but want to be kept informed about the studies for your future consideration, please register your name and contact information at: VitalityInAging.org

By enrolling in the **Longitudinal Study** or registering your potential interest, you will be kept informed about new and current research initiatives spearheaded by the **Vitality in Aging** research group and local meetings.

To receive **email updates** about results from regenerative medicine trials, as well as about how you can gain **affordable access** to many of the interventions, you can join a private association called the **Age Reversal Network** at no cost by logging on to: https://age-reversal.net/join

Vitality in Aging Longitudinal Study

Modeled on the Framingham Heart Study

- ✓ Long-term and Ongoing
- ✓ No Upper Age Threshold
- ✓ No Strict Exclusion Criteria!

Framingham Heart Study

Began in 1948 with 5,209 adults from Framingham, MA.

Prior to Framingham, little was known about hypertension/cardiovascular risks.

At that time, doctors did not know how to prevent heart attacks.

Atherosclerosis was thought to be an unavoidable aspect of normal aging.

Vitality in Aging Longitudinal Study

Battle Plan to Defeat Aging

- ✓ Identify "Risk Factors" That Cause Aging
- ✓ Access Biomarker Tests at Subsidized Prices
- ✓ Access Interventions at Discount Prices
- ✓ Test Safety and Efficacy of Self-experimentation
- ✓ Accelerate Science of Human Age Reversal

Become Part of a Team Effort to Defeat Aging!

Framingham Heart Study

Millions of Lives Saved

Framingham findings revealed role of diet and other artery-clogging factors.

3,000 medical papers published using Framingham—now in its third generation.

Framingham heart study is source of the term "risk factor".

NEW!

Age Management Blood Panel

The **Vitality in Aging** research group has come up with a blood test panel that provides keen insight into our "**biological age**," along with affordability and ease of access.

The **Age Management Blood Panel** will enable as many people as possible to have these tests performed at baseline (before undergoing a potential age reversal intervention), and at follow-up intervals afterwards.

This new panel enables most to have a blood draw done in their local area. The results provide an in-depth snapshot of current health status to help determine what lifestyle changes or experimental interventions you may consider.

The cost of having all these tests done by commercial labs is outrageous. One large commercial lab quoted us over **$3,000** for this elaborate test panel.

Through group purchasing, the **Vitality in Aging** research group has arranged for this comprehensive test panel to be available for **$495**, a savings of almost **85%**.

This heavily subsidized price will be in effect only for a limited time. It will move ***higher*** as more people enroll and use up the subsidized pricing allotted for this study.

You can order the **Age Management Blood Panel** now and defer your blood draw until you are ready to initiate one of several experimental age reversal options. Current research protocol summaries are posted on **https://vitalityinaging.org/via-interventions-trial/**

To order the new **Age Management Blood Test Panel**, log on to VitalityInAging.org/sign-up

Here is a list of the tests included in the new **Age Management Panel**. Descriptions of the importance of some of the tests are provided below:

CARDIAC/INFLAMMATORY MARKERS

- NMR Lipoprofile (measures atherogenic lipid risks + inflammation markers)
- Homocysteine
- C-Reactive Protein
- IL-6 (interleukin-6)
- Apolipoprotein B
- Omega Index—Comprehensive (this is a finger stick kit)

HORMONES AND BINDING PROTEINS

- IGF-1
- IGF1BP3
- DHEA-S
- Free Testosterone
- Total Testosterone
- Estradiol
- Progesterone (Female Only)
- Vitamin D 25-Hydroxy

THYROID FUNCTION

- Free T3
- Free T4
- TSH (Thyroid Stimulating Hormone)

INSULIN RESISTANCE MARKERS

- Insulin
- HbA1C
- Ferritin

LIPIDS, GLUCOSE, LIVER-KIDNEY FUNCTION

- Glucose
- Uric Acid
- BUN
- Creatinine
- eGFR
- BUN/Creatinine
- Sodium
- Potassium
- Chloride
- Calcium
- Phosphorus
- Protein, Total
- Albumin
- Globulin
- A/G Ratio
- Bilirubin
- Alkaline Phosphatase
- LDH
- AST
- ALT
- GGT
- Iron
- Cholesterol, Total
- Triglycerides
- HDL Cholesterol
- LDL Cholesterol
- T. Chol/HDL Ratio
- Estimated CHD Risk

THE OMEGA-3 INDEX TEST MEASURES:

- Omega-3 Index percent
- Trans Fat Index
- Omega-6:Omega-3 Ratio
- AA:EPA Ratio
- Full Fatty Acid Profile including:
- Omega-3s
- Omega-6s
- Monounsaturated
- Saturated
- Trans

BLOOD COUNTS

- WBC Count
- RBC Count
- Hemoglobin
- Hematocrit
- MCV
- MCH
- MCHC
- RDW
- Platelet count
- Monocytes (% and absolute)
- Eos (% and absolute)
- Basos (% and absolute)
- Neutrophils (% and absolute
- Lymphs (% and absolute)
- Immature granulocytes
- Immature cells

PROSTATE CANCER SCREENING (MALES ONLY)

- **PSA**–(Prostate-Specific Antigen)

Here is a description of some of the unique tests included in the **Age Management Blood Test Panel:**

- **IGF-1**–(Insulin-like Growth Factor-1) is a surrogate marker of growth hormone status. Growth hormone is associated with muscle and skeletal strength, cognition, sleep, energy, and importantly, tissue recovery and repair. Too much growth hormone can create health issues just as too little can.
- **IGF1-BP3**–(IGF Binding Protein 3)–This protein helps ensure IGF-1 is transported efficiently to tissues throughout the body. Both low and high levels may lead to concerns with IGF-1's distribution and biological activity.
- **IL-6 (Interleukin-6)**–A pro-inflammatory cytokine associated with chronic and acute inflammatory states. High levels may be associated with increased presence of senescent cells as well as many other degenerative and malignant health processes that may limit the efficacy of age reversal therapies. Long-lived individuals usually have low blood levels of IL-6.[2-7] If your IL-6 is elevated, then measures will be recommended to reduce it.
- **Apolipoprotein B–**A surface marker on **non-HDL cholesterol**, low blood levels of apolipoprotein B have been shown to be associated with decreased coronary artery disease risk by up to **90%**.[8] Another study shows regression of arterial plaque when apolipoprotein B blood levels are reduced.[9]
- **Omega-3 Index (complete)**–An in-depth analysis of blood fatty acid profile, reflective of long-term dietary patterns and balance of proinflammatory and anti-inflammatory signaling molecule precursors. This comprehensive **fatty acid profile** includes the following individual tests:
  - **Omega-3 Index**–Overall percentage of omega-3 fatty acids in the blood. An optimal omega-3 index corresponds with positive cardiovascular, cognitive, and whole-body health and can be achieved through dietary consumption of omega-3-rich foods as well as with high-quality marine oil supplementation. **Life Extension®** recommends most people seek to achieve an **Omega-3 Index** score of **8%** and higher.
  - **Omega 6: Omega-3 ratio**–Ratio of total omega-6 fatty acids compared to omega-3 fatty acids. To maintain healthy inflammatory response activity, **Life Extension** believes this ratio should remain under **4:1** and as close to **1:1** as possible.
  - **AA:EPA ratio**–A specific ratio of **arachidonic acid** (AA) and healthy eicosanoid promoting **eicosapentaenoic acid** (EPA). Ideal **AA:EPA ratios** are **1.7:1** or less.
  - **Trans-Fat Index**–Percentage of blood fatty acids in the unnatural trans-configuration, associated with higher processed food intake. Trans fats may interfere with the normal activity of natural fatty acids.
  - **Full Fatty Acid Profile**–Whole blood analysis of 24 fatty acids, including various polyunsaturated, monounsaturated, saturated, and trans-fatty acids. May help reveal irregular patterns of fatty acid conversion or imbalanced dietary fat intake.
- **NMR LipoProfile**–A deep analysis of blood lipids, the NMR offers insight into LDL particle count, as well as average particle size (LDL pattern) providing better risk analysis of cholesterol lipoproteins and their relationship to atherogenesis. The **NMR LipoProfile** includes the following tests:
  - **LDL particle number (LDL-P)**-A direct measurement of LDL particle count, an independent risk factor for cardiovascular disease.
  - **Small LDL particle number (small LDL-P)**–Number of small, dense, LDL particles. Smaller LDL particles are considered more atherogenic, so higher levels are considered a cardiovascular risk factor.
  - **HDL particle number (HDL-P)**–A count of HDL particles, where higher levels are considered more protective, due to their role in reverse-cholesterol transport.
  - **LDL particle size**–Pattern A is considered an ideal result, corresponding with larger, less atherogenic LDL particles.
  - **Standard cholesterol test** (LDL-C, HDL-C, triglycerides, and total cholesterol)—More predictive of risk than a simple total cholesterol test.
  - **LP-IR (Insulin Resistance Score)–**A composite score, based on various lipoprotein markers, that indicates risk of developing insulin resistance. Higher values indicate increased risk of developing insulin resistance.

Note: If the address you enter at (VIA blood test order landing page) is from one of the following states: NY, NJ, RI, MA, or MD, you will not be able to select "requisition" from the drop-down menu. If you have a residential address from one of the other 44 continental U.S. states, please enter that instead. Then you can drive to a LabCorp facility in any of the states other than the above-named five with the requisition that will be emailed to you, and have your blood drawn.

An alternative for those in the five states with restrictions would be to get a prescription from a doctor for the Age Management Panel. The much higher commercial lab price may make a blood draw trip to a neighboring state more cost effective.

Concluding Remarks

The **Vitality in Aging** research groups are making headway in measuring the efficacy of currently available regenerative interventions.

The goal is to identity which combinations of interventions are most effective in inducing meaningful human age reversal.

By enrolling in the **Vitality in Aging Longitudinal Study**, you obtain baseline measures of your state of health and can track improvements that occur in response to whichever rejuvenation protocol you choose (or do NOT choose).

Data sets will be compared to enable rapid identification of the most robust approaches to **age reversal** available today!

I look forward to keeping you posted on new plans for transforming emerging scientific findings into **practical steps** to improve ***your*** health and longevity.

To receive **email updates** about results from regenerative medicine trials, as well as about how you can gain **affordable access**, you can join a private association called the **Age Reversal Network** at no cost by logging on to: **https://age-reversal.net/join**

Note the **Age Reversal Network** is entirely separate from the **Life Extension®** group I founded in **1977** (and first published in **1980**).

You can read a description of the **Age Reversal Network** on the next page.

For longer life,

William Faloon
Co-Founder,
Coalition for Radical Life Extension
Age Reversal Network

Enroll for RAADfest 2020 At Discount Prices

RAADfest 2019 attendees gained unexpected access to medical exams and advanced diagnostics at a fraction of normal pricing.

What's more, a company that wants to support our studies committed to providing the initial study subjects with a complimentary bottle of **dasatinib**, a (senolytic drug), provided they have a prescription. This bottle of medication may last most of the early participants in the **Vitality in Aging Longitudinal Study** for several years. (New study subjects will have to purchase this medication, and the Age Reversal physicians' network can refer them to low-cost sources.)

Most of the diagnostic tests performed at **RAADfest 2019** will be repeated at **RAADfest 2020** to see how much age reversal may have occurred in each study subject.

Large rooms have been reserved in the hotel to accommodate the expected number of people who want to enroll in clinical studies and initiate interventions at the RAADfest clinic, such as **NAD^+ infusions**.

There has never been such an **interactive conference** where attendees not only learn about healthy longevity advances, but also get to participate as study subjects at the same time!

The potential value of having attended **RAADfest 2019** cannot be overstated.

You can enroll now for **RAADfest 2020** at a special rate of **15%** off the current published price, which increases incrementally as we approach RAADfest.

Just log on to **www.raadfest.com** and use the discount code "LEF" when you register, in order to receive this special offer of **15%** off.

This code is valid until March 1, 2020. To register at these lower prices, log on to:

www.raadfest.com

P.S. The **Age Reversal Network** is an informal association, with no funding for staff. If you contact us with questions, please be patient with communication delays, as we have minimal staff to answer questions of a few thousand people currently registered to receive updates.

About the Age Reversal Network (Age-Reversal.net)

The purpose of the **Age Reversal Network** is to exchange scientific information, foster strategic alliances, and support biomedical endeavors aimed at reversing degenerative aging.

We seek to unite people in ways that will accelerate the availability of rejuvenation technologies to benefit all of humanity, including members of the group. As data emerge, the **Age Reversal Network** will seek to rapidly convey this to members of our private association.

The **Age Reversal Network** consists of several thousand individuals who have expressed their desire to donate to and/or actively participate in advancing human age reversal studies.

Our public benefit group functions as a **private association** and consists of physicians, scientists, activists, donors, and participants in previous age reversal initiatives. These individuals share a common desire to rejuvenate aged people.

Partnerships may form within or outside the group in any manner the individual members choose. Information will be shared at the discretion of the individual members.

The **Age Reversal Network** serves as an open-source communications channel to a wide variety of experimental technologies.

There are some individuals in this group who are bound by confidentiality/nondisclosure contracts. We nonetheless welcome their input and any meaningful scientific data they are permitted to disseminate. A key to our success will be open-source information sharing whenever feasible.

Those who choose to participate in clinical trials or self-experiment with therapies described by the **Age Reversal Network** should do so with the knowledge that any intervention can have unknown risks.

Members of this private association acknowledge they are embarking on a voyage with historic implications relating to human longevity. As with any exploratory venture, the outcome cannot be predicted, and any medical intervention carries inherent risks, especially for elderly individuals.

Professional medical advice should be sought before undergoing any potential treatment you learn about from the **Age Reversal Network**.

To register as a member of the **Age Reversal Network** and receive updates about regenerative medicine research initiatives, please log on to **Age-Reversal.net/join**. (There is no cost to join.)

References

1. Fahy GM, Brooke RT, Watson JP, et al. Reversal of epigenetic aging and immunosenescent trends in humans. *Aging Cell.* 2019 Dec;18(6):e13028.
2. Ershler WB, Keller ET. Age-associated increased interleukin-6 gene expression, late-life diseases, and frailty. *Annu Rev Med*. 2000;51:245-70.
3. Harris TB, Ferrucci L, Tracy RP, et al. Associations of elevated interleukin-6 and C-reactive protein levels with mortality in the elderly. *Am J Med.* 1999 May;106(5):506-12.
4. Duarte PO, Duarte MGF, Pelichek A, et al. Cardiovascular risk factors and inflammatory activity among centenarians with and without dementia. *Aging Clin Exp Res.* 2017 Jun;29(3):411-7.
5. Garbers C, Kuck F, Aparicio-Siegmund S, et al. Cellular senescence or EGFR signaling induces Interleukin 6 (IL-6) receptor expression controlled by mammalian target of rapamycin (mTOR). *Cell Cycle.* 2013 Nov 1;12(21):3421-32.
6. Gomez CR, Karavitis J, Palmer JL, et al. Interleukin-6 contributes to age-related alteration of cytokine production by macrophages. *Mediators Inflamm.* 2010;2010:475139.
7. Varadhan R, Yao W, Matteini A, et al. Simple biologically informed inflammatory index of two serum cytokines predicts 10 year all-cause mortality in older adults. *J Gerontol A Biol Sci Med Sci.* 2014 Feb;69(2):165-73.

8. Tabas I, Williams KJ, Boren J. Subendothelial lipoprotein retention as the initiating process in atherosclerosis: update and therapeutic implications. *Circulation.* 2007 Oct 16;116(16):1832-44.
9. Masson W, Siniawski D, Lobo M, et al. Association between LDL-C, Non HDL-C, and Apolipoprotein B Levels with Coronary Plaque Regression. *Arq Bras Cardiol.* 2015 Jul;105(1):11-9.

COMBAT Senescent Cells and AGING

Science of *Senolytics*!

Senescent cells are old cells that no longer divide but they emit factors that *accelerate* aging.

Senolytic compounds selectively help target senescent cells in the body.

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

Once-Weekly Senolytic Formula

Senolytic Activator provides a highly ***absorbable*** form of **quercetin phytosome** and black tea **theaflavins** designed to enhance the body's ability to manage **senescent cells**.

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

Item #02301 • 24 vegetarian capsules

1 box **$18**

4 boxes $16 each

(Each box lasts three months.)

NON GMO LE CERTIFIED

For full product description and to order **Senolytic 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.

Increase AMPK to Lower mTOR

Most people today consume too many excess calories.

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

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

Reduce Cell Fat Storage

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

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

AMPK Metabolic Activator is a dual-nutrient formula designed to support healthy AMPK cellular activation.

Item #02207 • 30 vegetarian tablets

1 bottle **$28.50**

4 bottles $24 each

References

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

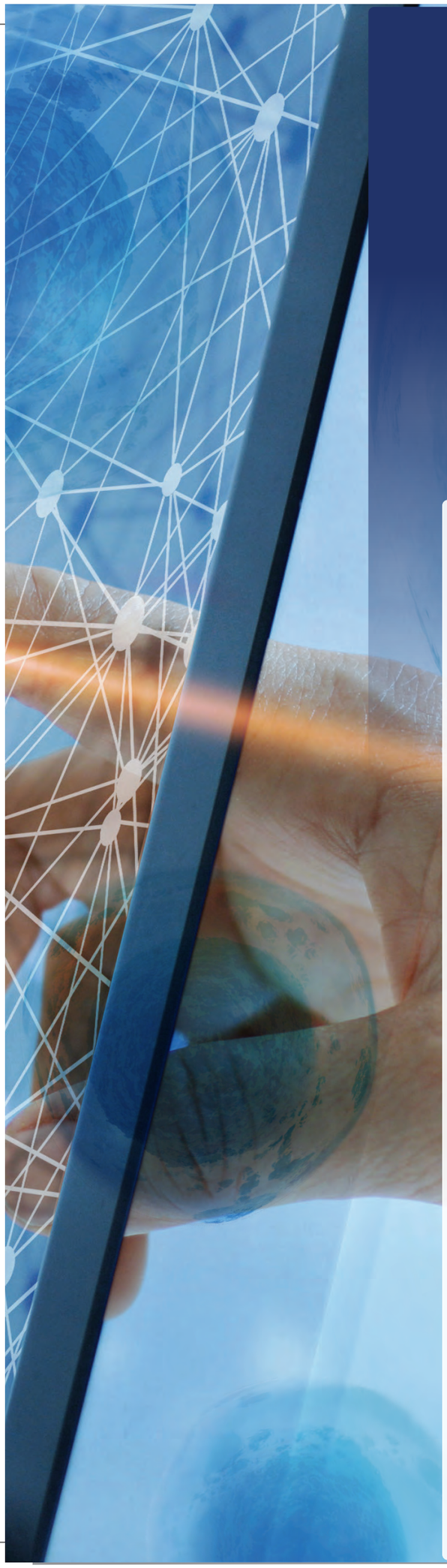
For full product description and to order **AMPK Metabolic Activator**, call **1-800-544-4440** or visit **www.LifeExtension.com**

NON GMO LE CERTIFIED 1 DAILY

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

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

ARTIFICIAL INTELLIGENCE



Restore Healthy **STEM CELL** Function

BY ROGER HARVEY

The tissues of your body come with a built-in "backup" system known as tissue-specific **stem cells**.

As **functional cells** in our **tissues** grow old, embedded **stem cells** can replace them by producing new healthy cells.

These fresh **functional cells** rejuvenate aging tissues.

What few people know is that stem cells have the power to reproduce themselves (self-renew) so they can continue to replace aging functional cells.

So why do our tissues still grow old and lose function as we age?

The problem is that stem cells are *also* adversely impacted by aging.

Over time, our stem cells accumulate damage just like other cells do. This compromises their ability to keep tissues healthy and fully functional.[1]

Scientists at **Life Extension®** partnered with a deep-learning AI biotech group called **InSilico Medicine**. The mission was to discover ways to keep stem cells young and refreshed.

Three plant-based nutrients (**garcinol**, **piceatannol** and **resveratrol**) have been found to promote stem cell health.

Researchers showed that these compounds can help protect and revitalize **stem cells**.[2-10]

What *Are* Stem Cells?

Most cells in our tissues are **specialized** for specific functions.

A **neuron**, for example, is a cell in the nervous system which has been specifically designed to respond to stimuli and conduct electrical impulses. A **muscle cell** has developed a distinct machinery to enable it to **contract**—to shorten forcefully to create movement.

These cells, and others throughout the tissues of the body, cannot change types once they mature. A neuron is always a neuron. A muscle cell is always a muscle cell.

In addition, many of these kinds of cells **cannot divide** to produce more cells. They die off and must be replaced by new cells.

But most tissues *also* have a small population of **stem cells** (also referred to as tissue-specific **progenitor cells**). They are critically important for the maintenance and health of every tissue.

How *Do* Stem Cells Regenerate?

Stem cells act as a reservoir to replace old, damaged, or dying cells.

When specialized (functional) cells in tissues stop working or are impaired by injury or disease, stem cells have the ability to develop into the needed cell type to replace them.

This helps rejuvenate and repair the tissues themselves.

To work properly, stem cells must perform two basic functions:

- **Self-renewal**. Stem cells continue to **divide**, forming new stem cells. This maintains the available pool of stem cells and ensures there are enough cells to allow some to develop into specialized cells.
- **Differentiation**. When needed, stem cells transform into specialized functional cell types which replace ones that have been lost or damaged.

When stem cells are working properly, they help maintain tissue and organ function and repair/defend tissues against disease, injury, and aging.

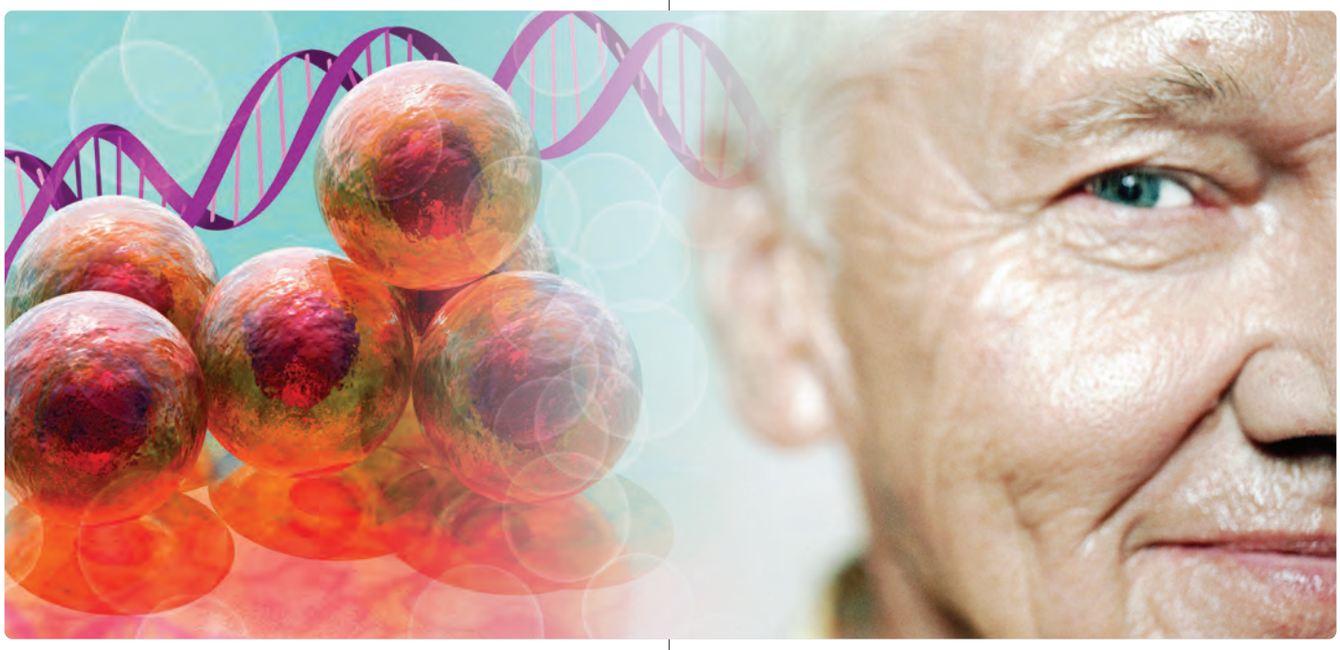
Stem Cells and Aging

It's a nearly perfect system—with one huge flaw.

While stem cells are meant to keep tissues young and healthy, advancing age takes its toll on them as well.[1]

As this damage accumulates over time, stem cells stop dividing as effectively, lose the ability to replace old and damaged tissue cells, and begin to die.

This causes the entire tissue to age more rapidly and lose its function. Physical frailty advances, cognitive abilities decline, metabolism slows, and the body becomes more susceptible to age-related disease and dysfunction.



Revitalizing Stem Cells

The deterioration of stem cells may seem inevitable. But it's not.

Scientists have found that there are ways to protect these cells and restore their youthful function:

- Activating the enzyme **AMPK**—considered the "master regulator" of metabolism in the body. This improves energy balance in stem cells and leads to replacement of old, damaged proteins.[11,12]
- Inhibiting **mTOR** (an enzyme that regulates protein synthesis and cell growth) and activating **FoxO** (a protein that regulates the expression of genes). This limits the buildup of toxins and enhances **autophagy**, cellular "housekeeping" that keeps stem cells running smoothly.[13-15]
- Activating **sirtuins**, proteins that regulate cellular health, and protect and repair DNA.[16,17]
- Blocking the action of *enzymes* (called **histone acetyltransferases**) to reduce changes to genetic material that lead to cellular dysfunction.[18]

Nutrients That Improve Stem Cell Health

Three nutrients found in plants, **garcinol**, **piceatannol**, and **resveratrol**, have been shown to perform *all* these stem-cell-protecting actions.

Garcinol

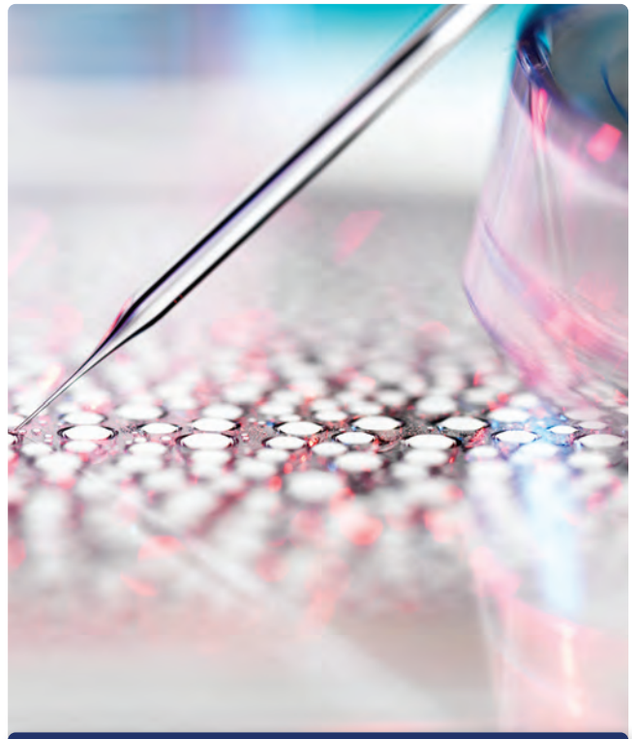
As stem cells age, their expression of genetic material can be changed by a process known as **histone acetylation**.

In some cases, **histone acetylation** can drive up expression of damaging factors which can be very detrimental to the cell. This is one of the main causes of stem cell aging and loss of function and can lead to cellular dysfunction and risk for age-related disease.

An enzyme called **histone acetyltransferase** (**HAT**) is required for histone acetylation to occur. If we can *block* the enzyme, we can *stop* certain harmful processes and restore youthful stem cell function.

Scientists are looking for synthetic drugs that can inhibit HAT, but there's already a nutrient that can do it.

Garcinol is a compound extracted from the fruit of the **mangosteen** tree.[19] Preclinical studies have shown garcinol to be a potent HAT inhibitor. By inhibiting HAT (**histone acetyltransferase**), it *reduces* harmful chemical changes that affect gene expression.[7,20]



WHAT YOU NEED TO KNOW

Plant-Derived Nutrients Revitalize Stem Cells

- **Stem cells** are found in many organs and tissues in the body. They have the ability to self-reproduce and to develop into specialized tissue cells, replacing dead and damaged cells and keeping tissues youthful.
- Stem cells also lose function over time, causing tissues to age and deteriorate.
- Scientists have discovered three plant-derived nutrients, **garcinol**, **piceatannol**, and **resveratrol**, that can *reverse or repair* age-related changes in stem cells.
- By keeping stem cells healthy, these nutrients may allow them to rejuvenate their tissues so they can continue functioning optimally.

This directly benefits stem cells, promoting the expression of genes involved in **self-renewal** and suppressing others that restrict it. In an ex vivo study of human blood stem cells, garcinol caused their numbers to increase more than **4.5-fold**.[7]

Garcinol may also promote the development of stem cells into specialized tissue cells. For example, garcinol treatment promotes differentiation of rat neural stem cells into neurons.[9]

Piceatannol

Piceatannol is found in fruits including red and white grapes, passion fruit, and blueberries.[21]

Preclinical studies indicate that it has the ability to stimulate cellular housekeeping and sirtuin function, which has a beneficial impact on stem cells.[22]

In a preclinical study, human stem cells isolated from fat tissues were differentiated into mature fat cells in the presence or absence of **piceatannol**. The cells grown with piceatannol displayed improved **fat** metabolism and healthier function, as well as reduced uptake of **sugar** which normally would be converted into fat.[3]

And in cell culture and adult mice, **piceatannol** helped neural stem cells differentiate to produce new, specialized brain cells called **astrocytes**.[2]

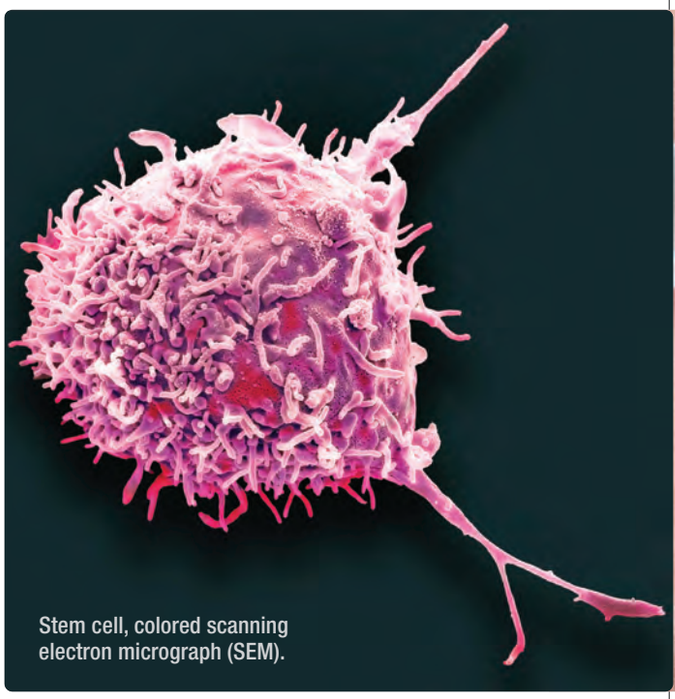
Resveratrol

Resveratrol, a nutrient found in the skin of red grapes, has long been known to have a wide range of health benefits.

Several recent studies have shown that it may specifically help restore healthy **stem cell** function by:

- **Activating SIRT1.** In a study of human stem cells, resveratrol increased activity of SIRT1, a sirtuin protein linked to longevity and anti-aging. This resulted in improved self-renewal of the stem cells as well as differentiation into specialized cells.[8]
- **Activating AMPK.** One recent study showed that resveratrol helps osteogenic stem cell differentiation via AMPK activation.[23]
- **Enhancing mitochondrial function.** In aging mice and in cell culture, resveratrol restored healthier cellular metabolism by improving the function of mitochondria.[6]
- **Inhibiting mTOR.** Too much activity of the enzyme mTOR can lead to premature cellular aging.[24] Mouse embryonic stem cells treated with resveratrol had *decreased* mTOR activity, making them more youthful and enhancing their self-renewal ability.[5]

In one recent study, researchers subjected mice to chemotherapy, a harsh treatment that accelerates the aging of ovarian stem cells. But when the animals were treated with **resveratrol**, the loss of ovarian **stem cells** was alleviated.[10]



Stem cell, colored scanning electron micrograph (SEM).

Protecting stem cells translates into clear improvements in tissue function. In a rat animal model, scientists created an injury to the **aorta**, the artery that carries blood from the heart to the rest of the body. In the rats treated with resveratrol, their **stem cells** were better able to replace the damaged **endothelial cells**, leading to **accelerated healing/repair** of the injured artery.[4]

In humans, resveratrol treatment reduced mean fat cells' size and improved adipogenesis (differentiation of pre-adipocytes into fat cells) related to improved sensitivity of tissues to insulin.[25]

Resveratrol and piceatannol are both stilbenes, close relatives. In one cell study, resveratrol and piceatannol worked **synergistically** to enhance each other's ability to stimulate cellular housekeeping and sirtuin function.[22]

Taken together with garcinol, they may provide thorough benefits to stem cells.

Summary

Stem cells are present in many tissues, providing a built-in means to replace dead, dying, and damaged cells, rejuvenating the tissue.

But stem cells are *also* damaged over time, reducing their ability to function properly.

Scientists have identified three nutrients found in plants that have a powerful impact on stem cell health and functions: **garcinol, piceatannol** and **resveratrol**.

Garcinol's Anti-Cancer Activity

Garcinol can stimulate the self-renewal *and* growth of healthy stem cells.

The activity of cancer stem cells has been linked to drug resistance and tumor relapse.

In one study garcinol treatment inhibited both lung tumor growth and viability of lung cancer stem cells.[26]

Several preclinical studies have shown that it may suppress the growth of various types of cancers, including cervical, breast, oral, and prostate cancers.[27-30]

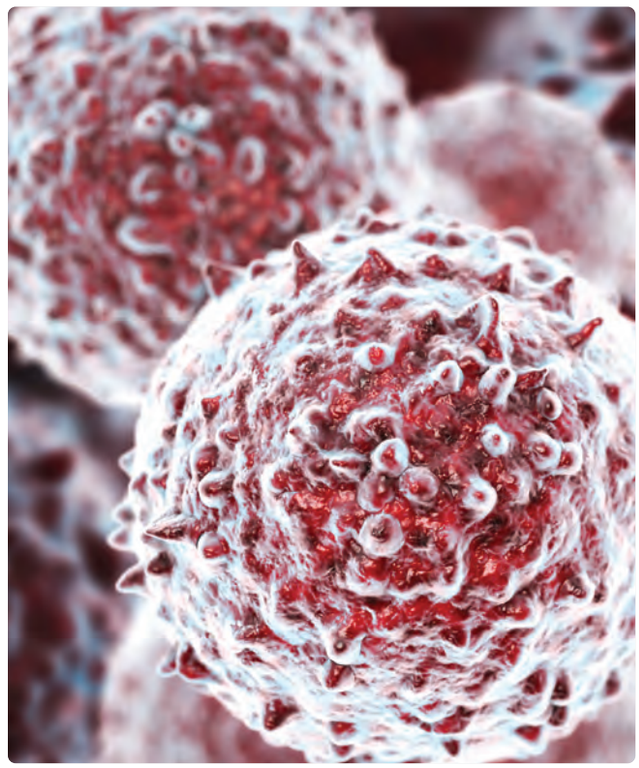
Each of these compounds protects and revitalizes stem cells, enhancing their self-renewal *and* their ability to grow into mature tissue cells.

Maintaining a healthy pool of stem cells can keep tissues functioning optimally, warding off age-related degeneration and loss of function. •

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

References

1. Oh J, Lee YD, Wagers AJ. Stem cell aging: mechanisms, regulators and therapeutic opportunities. *Nat Med.* 2014 Aug;20(8):870-80.
2. Arai D, Kataoka R, Otsuka S, et al. Piceatannol is superior to resveratrol in promoting neural stem cell differentiation into astrocytes. *Food Funct.* 2016 Oct 12;7(10):4432-41.
3. Carpene C, Pejenaute H, Del Moral R, et al. The Dietary Antioxidant Piceatannol Inhibits Adipogenesis of Human Adipose Mesenchymal Stem Cells and Limits Glucose Transport and Lipogenic Activities in Adipocytes. *Int J Mol Sci.* 2018 Jul 17;19(7).
4. J G, Cq W, Hh F, et al. Effects of resveratrol on endothelial progenitor cells and their contributions to reendothelialization in intima-injured rats. *J Cardiovasc Pharmacol.* 2006 May;47(5):711-21.
5. Li N, Du Z, Shen Q, et al. Resveratrol Enhances Self-Renewal of Mouse Embryonic Stem Cells. *J Cell Biochem.* 2017 Jul;118(7):1928-35.
6. Lv YJ, Yang Y, Sui BD, et al. Resveratrol counteracts bone loss via mitofilin-mediated osteogenic improvement of mesenchymal stem cells in senescence-accelerated mice. *Theranostics.* 2018;8(9):2387-406.
7. Nishino T, Wang C, Mochizuki-Kashio M, et al. Ex vivo expansion of human hematopoietic stem cells by garcinol, a potent inhibitor of histone acetyltransferase. *PLoS One.* 2011;6(9):e24298.
8. Wang X, Ma S, Meng N, et al. Resveratrol Exerts Dosage-Dependent Effects on the Self-Renewal and Neural Differentiation of hUC-MSCs. *Mol Cells.* 2016 May 31;39(5):418-25.
9. Weng MS, Liao CH, Yu SY, et al. Garcinol promotes neurogenesis in rat cortical progenitor cells through the duration of extracellular signal-regulated kinase signaling. *J Agric Food Chem.* 2011 Feb 9;59(3):1031-40.
10. Wu M, Ma L, Xue L, et al. Resveratrol alleviates chemotherapy-induced oogonial stem cell apoptosis and ovarian aging in mice. *Aging (Albany NY).* 2019 Feb 14;11(3):1030-44.
11. Avolio E, Gianfranceschi G, Cesselli D, et al. Ex vivo molecular rejuvenation improves the therapeutic activity of senescent human cardiac stem cells in a mouse model of myocardial infarction. *Stem Cells.* 2014 Sep;32(9):2373-85.
12. Burkewitz K, Zhang Y, Mair WB. AMPK at the nexus of energetics and aging. *Cell Metab.* 2014 Jul 1;20(1):10-25.
13. Ho TT, Warr MR, Adelman ER, et al. Autophagy maintains the metabolism and function of young and old stem cells. *Nature.* 2017 Mar 9;543(7644):205-10.
14. Ito K, Suda T. Metabolic requirements for the maintenance of self-renewing stem cells. *Nat Rev Mol Cell Biol.* 2014 Apr;15(4):243-56.
15. Warr MR, Binnewies M, Flach J, et al. FOXO3A directs a protective autophagy program in haematopoietic stem cells. *Nature.* 2013 Feb 21;494(7437):323-7.
16. Liu X, Hu D, Zeng Z, et al. SRT1720 promotes survival of aged human mesenchymal stem cells via FAIM: a pharmacological strategy to improve stem cell-based therapy for rat myocardial infarction. *Cell Death Dis.* 2017 Apr 6;8(4):e2731.
17. Yuan HF, Zhai C, Yan XL, et al. SIRT1 is required for long-term growth of human mesenchymal stem cells. *J Mol Med (Berl).* 2012 Apr;90(4):389-400.
18. Jung JW, Lee S, Seo MS, et al. Histone deacetylase controls adult stem cell aging by balancing the expression of polycomb genes and jumonji domain containing 3. *Cell Mol Life Sci.* 2010 Apr;67(7):1165-76.
19. Padhye S, Ahmad A, Oswal N, et al. Emerging role of Garcinol, the antioxidant chalcone from Garcinia indica Choisy and its synthetic analogs. *J Hematol Oncol.* 2009 Sep 2;2:38.
20. Balasubramanyam K, Altaf M, Varier RA, et al. Polyisoprenylated benzophenone, garcinol, a natural histone acetyltransferase inhibitor, represses chromatin transcription and alters global gene expression. *J Biol Chem.* 2004 Aug 6;279(32):33716-26.
21. Kershaw J, Kim KH. The Therapeutic Potential of Piceatannol, a Natural Stilbene, in Metabolic Diseases: A Review. *J Med Food.* 2017 May;20(5):427-38.
22. Pietrocola F, Marino G, Lissa D, et al. Pro-autophagic polyphenols reduce the acetylation of cytoplasmic proteins. *Cell Cycle.* 2012 Oct 15;11(20):3851-60.



23. Zhou T, Yan Y, Zhao C, et al. Resveratrol improves osteogenic differentiation of senescent bone mesenchymal stem cells through inhibiting endogenous reactive oxygen species production via AMPK activation. *Redox Rep.* 2019 Dec;24(1):62-9.
24. Available at: https://www.leafscience.org/mtor-is-linked-to-diabetes-and-aging/. Accessed November 21, 2019.
25. Konings E, Timmers S, Boekschoten MV, et al. The effects of 30 days resveratrol supplementation on adipose tissue morphology and gene expression patterns in obese men. *Int J Obes (Lond).* 2014 Mar;38(3):470-3.
26. Huang WC, Kuo KT, Adebayo BO, et al. Garcinol inhibits cancer stem cell-like phenotype via suppression of the Wnt/beta-catenin/STAT3 axis signalling pathway in human non-small cell lung carcinomas. *J Nutr Biochem.* 2018 Apr;54:140-50.
27. Zhao J, Yang T, Ji J, et al. Garcinol exerts anti-cancer effect in human cervical cancer cells through upregulation of T-cadherin. *Biomed Pharmacother.* 2018 Nov;107:957-66.
28. Ye X, Yuan L, Zhang L, et al. Garcinol, an acetyltransferase inhibitor, suppresses proliferation of breast cancer cell line MCF-7 promoted by 17beta-estradiol. *Asian Pac J Cancer Prev*. 2014;15(12):5001-7.
29. Aggarwal S, Das SN. Garcinol inhibits tumour cell proliferation, angiogenesis, cell cycle progression and induces apoptosis via NF-kappaB inhibition in oral cancer. *Tumour Biol.* 2016 Jun;37(6):7175-84.
30. Wang Y, Tsai ML, Chiou LY, et al. Antitumor Activity of Garcinol in Human Prostate Cancer Cells and Xenograft Mice. *J Agric Food Chem*. 2015 Oct 21;63(41):9047-52.

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References

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

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Will *Suzanne Somers'* Celebrity Status Wake the World Up to HUMAN AGE REVERSAL?

BY WILLIAM FALOON

As a ***Life Extension®*** reader, you are aware of methods to **delay** and **reverse** certain aspects of biological **aging**.

You accomplish this through **healthy behavior** patterns, along with personalized doses of **hormones** (like DHEA), standardized **nutrients**, and often proper use of **medications** (like metformin).

What you do today, however, was virtually unheard of when I incorporated the **Life Extension®** group in the **1970s**.

Back then, people accepted pathological **aging** as inevitable. Instead of taking steps to **forestall** it, they often engaged in **unhealthy behaviors** that accelerated the onset of degenerative illnesses.

What has transpired over the last **five decades** is nothing short of a **biomedical renaissance**.

Instead of waiting for disease to manifest, enlightened individuals nowadays have preventive medical checkups including **blood tests** so they can initiate corrective actions before a crippling disease strikes.

Suzanne Somers has written a new book titled ***A New Way to Age.***

It reveals information about **regenerative interventions** that ***Life Extension®*** readers have learned about in recent years.

What makes Suzanne's book different is that it will be discussed in the **mass media,** and the scientific details made available to a huge audience.

There is potential for ***A New Way to Age*** to be read by enough people so that the public's perception of **human age reversal** will evolve from "***can it be done?***" to "***how soon will it happen?***"

This article discusses how Suzanne's book may ignite widespread recognition that **rejuvenation** of older individuals will soon become part of routine medical practice.

Slowly Reaching Critical Mass

Beginning in **2014**, a series of discoveries converged in a way to indicate that **aging** can be partially **reversed**.

As **regenerative interventions** moved from lab animals to small **human** studies, demonstrations of efficacy spawned significant viewpoint changes.

The realization that older people might grow ***younger*** garnered favorable coverage in journals and the general media.

Despite a series of advances, the majority remain ignorant of even basic ways to counteract degenerative aging processes.

Need to Prioritize Human Research

In **2015**, the **FDA** approved the first trial of a drug (metformin) to delay or reverse aging.

Funding (**$75 million**) was secured in **2019** to initiate a study of elderly people to ascertain what degree of age control might be achieved using this one drug.

Readers of ***Life Extension***® were informed about **metformin** back in **1995**.

If it continues to take decades to initiate **clinical trials** for simple treatments like **metformin**, then most of us will miss the super-longevity boat.

There is thus an **urgent need** to accelerate the pace of **age-reversal** research and make it a societal priority!

A New Way to Age

In today's fragmented media world, **Suzanne Somers** remains one of the world's most recognizable celebrities. When she writes a book, she garners extensive news and mainstream media coverage.

The trend towards use of "**bioidentical hormone replacement**" away from **synthetic hormones** did not occur because of an overnight change in mainstream medical practice.

It was largely due to Suzanne's books and media appearances where she passionately advocated for more natural **hormone replacement** therapies.

Suzanne's pleas resulted in an avalanche of patients demanding **natural hormones** from their doctors. As patients educated their doctors, there were improvements in physicians' prescribing practices that focused on more rational hormone therapies, such as **natural progesterone** in lieu of dangerous **synthetic progestins**.

In her latest book, titled ***A New Way to Age***, Suzanne reveals a variety of **anti-aging** strategies that, up to now, have been limited to a minority of health-conscious individuals such as ***Life Extension***® readers.

If ***A New Way to Age*** garners mass readership, it could ignite a revolutionary approach to human **age reversal** analogous to the tidal-wave switch to **bioidentical hormones** that occurred beginning in the late 1990s.

What Happens When We Reach the "Tipping Point"?

Once critical mass about human age reversal is attained, the political, economic, charitable, and scientific dynamics undergo radical transformations.

As society prioritizes healthy lifespan extension, the pace of progress will accelerate, emulating other fields where technical advances transform the seemingly **impossible** into the routine at an even faster pace.

In **2014**, the funding available to support **age reversal** research was virtually non-existent. It has since grown to **hundreds** of **millions** of **dollars**, aimed at finding ways to make old people grow biologically *younger*!

Just imagine when annual spending to transform **aging** into a manageable condition reaches the **billions**.

This will happen as commercial interests compete to develop better **rejuvenation therapies**, while charities and governmental institutions simultaneously dedicate more funding to this research arena.

What's in Suzanne's Book?

Unlike ***Life Extension***® supporters, typical readers of Suzanne's books may require a lot of fundamental guidance as it relates to healthy lifestyle behaviors.

The initial chapters of ***A New Way to Age*** describe the basics relating to proper diet, exercise, supplements, hormones, stress management, and environmental toxins.

The importance of a balanced microbiome, why testosterone does not cause prostate cancer in men, and how to avoid heart attacks, are critical knowledge for novices who often only know conventional medicine's side of the story.

Moving past the basics are interviews with doctors engaged in a variety of experimental treatments. These include **age reversal** strategies you may already be practicing such as:

- Activating cellular AMPK
- Removal of senescent cells (senolytics)
- Suppression of excess mTOR
- Restoring youthful levels of NAD^+
- Stem cell enhancements

Can you imagine what will happen if **millions of people** start insisting their physicians prescribe **interventions** to enable all the above rejuvenation effects?

This kind of **mass uprising** will result in a **medical renaissance** away from the practice of waiting to treat each age-related disease as it insidiously manifests.

Are we Reaching a Tipping Point?

Major advances are **fast-tracking** our understanding of why we **age** and what **interventions** can partially reverse it.

In her ***New Way to Age*** book, **Suzanne Somers** advocates that people fight back by initiating **interventions** aimed at circumventing underlying aging processes.

While this is not new to ***Life Extension***® readers, it will likely be the **first time** a large segment of the public learns that aging can be at least partially controlled.

I cannot predict if Suzanne's new book will be the **tipping point** that ignites the ultimate **societal rebellion** against degenerative aging.

Over the past **40 years**, I've witnessed huge **behavior changes** in those who pay attention to the science of healthy aging.

I've had the privilege of actively participating in changing the public's view as it relates to slowing premature aging and reducing one's risk of common age-related disorders.

People today say that they are not going to **age** like their parents did.

If all this translates into a **critical mass** that realizes how close we are to meaningful **human age reversal**, significant resources will be expended toward achieving this goal.

As favorable data from **clinical trials** continue to be published, the fervor to grow biologically younger will be the inspiration for even more resources to be committed to this universal, benevolent cause.

We are rapidly approaching a time when **degenerative aging** will be looked back on the same way we see smallpox, polio, and the many infectious diseases that are now largely vanquished.

By challenging the notion that humans must inevitably **degenerate** as they grow **older**, we remove the artificial barrier of **cynicism** and ignorance that historically has delayed introductions of lifesaving techniques, from the ones as simple as **cardiopulmonary resuscitation,** to those as advanced as **organ transplantation**.

Human Age Reversal Already Demonstrated

This month's issue of ***Life Extension***® magazine describes findings from a recently published study showing **human** aging going in **reverse** by **2.5 years** using currently available therapies (metformin + DHEA + growth hormone).

We also describe on page 34 of this month's issue an even a more aggressive, stairstep approach to control of human aging using a broad spectrum of **regenerative interventions**.

If Suzanne's ***A New Way to Age*** book leads to the **tipping point** of scientific and public acceptance, look forward to exponential expansions of healthy human lifespans and personally participating in the **science of living longer**.

It all begins with taking care of yourself today! This includes healthy **lifestyle choices** advocated since we first published a newsletter (***Anti-Aging News***) in **1980**.

We endured fierce criticism (and governmental persecution) back in those days because the notion of slowing aging was considered "impossible" and serving no public interest.

But science is finally catching up to what ***Life Extension***® advocated. The work we have done for over 40 years is changing how long and how healthy people live.

Life Extension® continues to deliver scientifically validated information long before it becomes routine practice by the medical mainstream.

What's so exciting is that the **prospect of age reversal** is rapidly transforming into biomedical reality! •

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

To order a copy of *A New Way to Age*, call **1-800-544-4440** Item #34165 • Price: $21

tip·ping point
noun
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References

1. *Angiology.* 1994 Jun;45(6):419-28.
2. *Angiology.* 2003 Jul-Aug;54 Suppl 1:S33-44.
3. *Angiology.* 2000 Jan;51(1):31-7.
4. *Angiology.* 2005 Sep-Oct;56 Suppl 1:S25-32.

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References

1. *Altern Med Rev*. 2008 Dec;13(4):307-14.
2. *JOP*. 2005 May 10;6(3):206-15.
3. Available at: http://www.sabinsa.com/newsroom/articles/bacillus-coagulans-probiotic-of-choice-nutracos-march-april-2012.pdf. Accessed September 30, 2015.
4. Available at: http://www.sabinsa.com/newsroom/WhitePapers/Probiotics_For_Health_And_Well_Being_Nutra.pdf. Accessed September 30, 2015.

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References
1. *Front Microbiol.* 2016;7:1204.
2. *Korean J Nutr.* 2007;40(2):154-61.

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Older People Grow 2.5 Years Younger

BY CHANCELLOR FALOON

Worldwide media coverage in September 2019 described publication of the first clinical trial to demonstrate significant reversals of biological aging in a study group of humans!

A major advance in healthy longevity potential was published on **September 8, 2019**, in the journal ***Aging Cell***.[1]

A combination of **nutrients**, **hormones**, and a **drug** resulted in significant human **age reversal**, as measured by DNA methylation, in nine men aged 51 to 65.

The study was conducted by **Dr. Greg Fahy** and colleagues at the biotechnology company Intervene Immune, Inc., in collaboration with researchers from **Stanford University** and the **University of California, Los Angeles** (UCLA).

The study protocol consisted of individualized doses of:

1. **Human growth hormone (hGH),**
2. **DHEA, and**
3. **Metformin.**

Study subjects were also provided with **3,000 IU** of **vitamin D3** and **50 mg** of elemental **zinc** daily.

After one year, the study participants were **2.5 years** younger, as measured by multiple DNA methylation aging tests, than they would have been without treatment.

This innovative protocol resulted in multiple, system-wide, anti-aging benefits:

1. Regenerated **thymic** structure,
2. Improved **immune function** with signs of increased cancer protection,
3. Improved **prostate cancer** markers (PSA and percent free PSA),
4. Regenerative effects on **kidney function** and **bone marrow**, and
5. On average, **2.5 years** of **age reversal**, as measured by four different **DNA methylation** tests.

This study, called the **TRIIM trial**, captured worldwide media attention.

Favorable commentary was published in the prestigious journal *Nature*.[2]

It was the first topic of discussion on **Joe Rogan's** podcast with Harvard scientist **David Sinclair**.[3] (Joe Rogan reaches more people than many network TV shows.)

In fact, according to Altmetric,[4] three months after publication, the paper was number four out of 1,455 in attention score (99th percentile) among similar sources, and in the top **5%** of all "research outputs" ever scored.

TRIIM stands for:

Thymus Regeneration, Immunorestoration, and Insulin Mitigation = TRIIM

This combined protocol was designed to reach just the first two of the above goals.

The **TRIIM trial** results, therefore, were far greater than expected.

Regeneration of the Thymus

The **thymus** is a gland located behind the sternum (breastbone) and in front of your lungs, and it is responsible for the development of **T-cells**.

Beginning at the age of **one**, although the thymus continues to grow, it begins to become replaced with fatty tissue.[6] The absolute mass of functional thymic tissue continues to increase until the early teenage years, but after that, progressive replacement by fat combined with a slow loss of thymic volume—a process known as **thymic involution**—results in a net decrease in thymic function. By the time we reach **50** years of age, the functional mass of the thymus is just a fraction of what it was at the onset of adolescence.[7]

The shrinkage, or involution, of the thymus has been correlated with:

1. Reductions in functional thymus-educated immune cells (T-cells),[8]
2. Reductions in T-cell receptors,[9]
3. Increased risk of several diseases,[10] and
4. Increased risk of all-cause mortality.[11]

Earlier research had shown that **growth hormone** treatment can **regenerate the thymus** gland in animals and relatively young immunodeficient HIV patients,[12-14] but the thymus of HIV patients is not normal.

"Cocktail of Drugs Gives First Hope That 'Biological Age' Can Be Reversed

As seen in *Forbes*, September 9, 2019

Scientists at Intervene Immune and Stanford Medical Center say they have proven that 'epigenetic aging can be reversed in humans.'

...they are optimistic that a person's biological age can be reversed."[5]

Age markers reversed by 2.5 years!

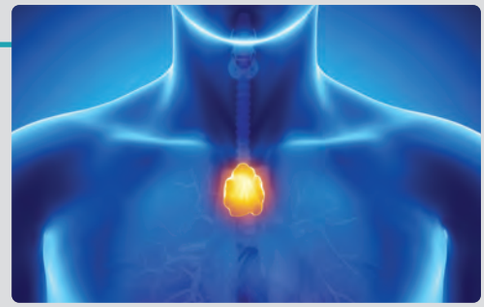
Source: https://www.forbes.com/sites/robinseatonjefferson/2019/09/09/cocktail-of-drugs-gives-first-hope-that-biological-age-can-be-reversed

"Turning back time!

As seen in *Daily Mail*, October 22, 2019

Aging is REVERSED in men using a cocktail of growth hormones and diabetes drugs in study that saw test group shed 2.5 biological years."

Source: https://www.dailymail.co.uk/health/article-7435427/Aging-REVERSED-small-group-men-study-reveals.html



Until the TRIIM trial, hGH had never been used with the aim of reversing immunological aging in otherwise healthy, aging volunteers.

Growth Hormone Safety

Traditionally, there has been concern that growth hormone treatment can cause **insulin resistance**, leading to a damaging and pro-aging increase in **insulin** levels, and might stimulate proliferation of **malignant** cells,[15,16] although actual long-term population studies on hGH safety have not found an increased cancer risk.[17]

In the TRIIM trial, both problems were apparently successfully contained by the combination protocol employed in this study: insulin levels remained lower than average, and cancer risk seemed to decrease based on three independent indices of cancer risk.

Remarkably, all study subjects showed **regeneration** of their **thymus**, which was validated by **MRI** scanning using a special imaging technique at Stanford after 0, 9, 12, and sometimes also after five months of treatment. Regeneration of the thymus was reflected by the replacement of age-related non-functional fat tissue with functional, fat-free tissue.

Regeneration was so clear-cut that it was statistically significant at many time points in seven out of nine participants. Two others showed about a **10%** increase in functional thymic mass, but the increase did not reach statistical significance because their baseline thymic fat contents were low for some reason. Overall, the probability that thymus regeneration did not occur was about one billionth of one billionth ($p<9x10^{-17}$), meaning that **MRI** evidence of thymic regeneration was incontrovertible.[1] (MRI scanning was funded in part by **Life Extension®**.)

Immune System Benefits

Several blood tests revealed that there was significant improvement in many biomarkers of **immune function** from the treatment protocol. Notably, there was an increase in the production of new T-cells, indicating that the basic T-cell manufacturing function of the thymus had been reactivated.

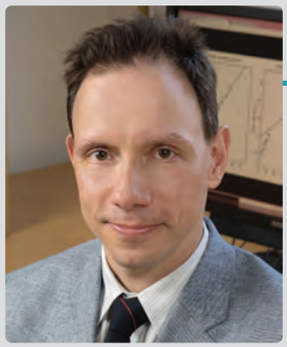
Three classes of new or "naïve" T-cells were shown to increase. Since new T-cells normally seem to survive and function for many years, the hope is that these new immune defenders will continue to protect the TRIIM participants from immunological aging for many years to come.

The trial also uncovered the fact that, according to sophisticated test results, the treated study subjects had an increased **lymphocyte** to **monocyte** ratio. A higher lymphocyte to monocyte ratio (LMR) has been linked to better outcomes for many types of cancer, atherosclerosis, cardiovascular disease, stroke,[18-21] and all-cause mortality. Furthermore, the increase in LMR did not change even six months after treatment ended.[1]

Dr. Fahy and his fellow researchers speculated that the benefits of having more lymphocytes in relation to monocytes might be due in large part to the fact that most monocytes express **CD38**, an **enzyme that destroys NAD+** and may drive age-related NAD+ depletion in tissues.[22] The LMR increase was driven mostly by a decrease in monocytes.

Although monocytes play an important role in "innate" immunity,[23] higher monocyte levels are associated with age-related frailty,[24] and CD38 expression increases as we age.

We need **NAD+** for a myriad of biochemical processes including **DNA repair** and cell energy production.[25] Therefore, it may be that the TRIIM protocol achieves systemic age-reversing effects at least in part by limiting the levels of NAD+-depleting CD38 monocytes while also restoring youthful thymic immunity.

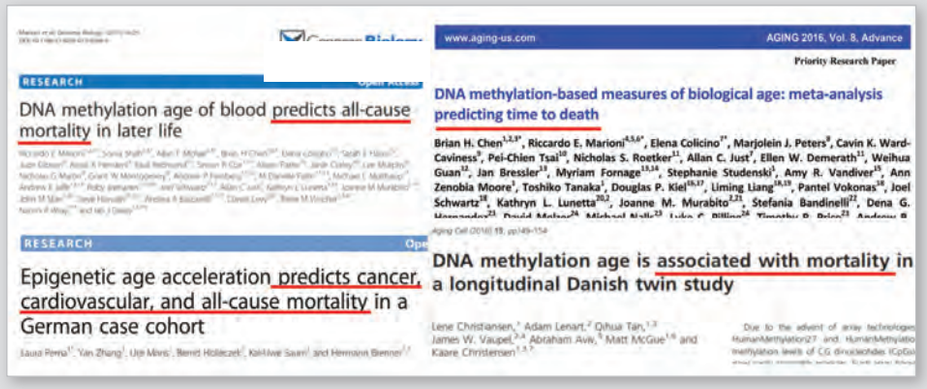


Steve Horvath, Ph.D.

Professor of Human Genetics & Biostatistics, UCLA Fielding School of Public Health

What is "Epigenetic Age"?

- "Biological" age calculated from DNA methylation
- DNA methylation regulates genes
- Genes regulate aging
- Better estimator than chronological age
- DNA methylation patterns predict risk of disease and death



Slide courtesy of Dr. Greg Fahy. Photo courtesy of Dr. Steve Horvath.

Reduced Cancer Risk Indicators

Immune function was also improved, as shown by a reduction in **PD-1** expression on **cytotoxic T-cells**.[1]

PD-1 is a receptor that cancer cells hijack to **trick** immune **T-cells** into thinking that the cancer is not a threat and they should not be attacked.[26]

Drugs that **block** the PD-1 receptor such as **Opdivo®** and **Keytruda®** have become multi-billion-dollar blockbuster drugs in recent years due to the survival improvement they demonstrate against several different cancers.[27]

Prostate cancer risk decreased in these study participants as shown through decreased **PSA** and improved percentage of **free PSA**.[1]

Additionally, **C-reactive protein** (a marker for systemic inflammation) decreased significantly.[1]

Elevated C-reactive protein is a biomarker for risk of both acute and chronic inflammatory conditions, including cardiovascular disease, surgical outcomes, and cancer mortality[28-32] and is an important marker for the generalized inflammation that normally accompanies aging ("inflammaging").

Overall, these results support the hypothesis that improving thymic function can help to prevent cancer and augment defenses against the disease.

Kidney Function

One unexpected discovery was that there was a significant improvement in kidney function, as demonstrated by an increased **glomerular filtration rate**, or GFR.[1]

Normally, kidney function never improves as aging proceeds, and end-stage renal failure now costs taxpayers more than $30 billion a year.

During the TRIIM treatment, GFR steadily improved, and the trend even seemed to continue for six months after discontinuing treatment. These results were one sign that perhaps the TRIIM treatment could influence systemic aging and might not be confined only to rejuvenation of the immune system.

Reversal of Epigenetic Age

Within the last six years or so, measurement of DNA methylation patterns has enabled the most accurate measurement of biological age presently available. These DNA methylation "clocks" are an exciting new development and are also allowing scientists to accurately predict future healthspan and lifespan.

Several different "clocks" of this kind have been developed, each with a somewhat different purpose

in mind. In combination with other carefully selected clinical markers, they will become increasingly valuable predictors of future healthspan and mortality.[1,33,34]

DNA Methylation Tests

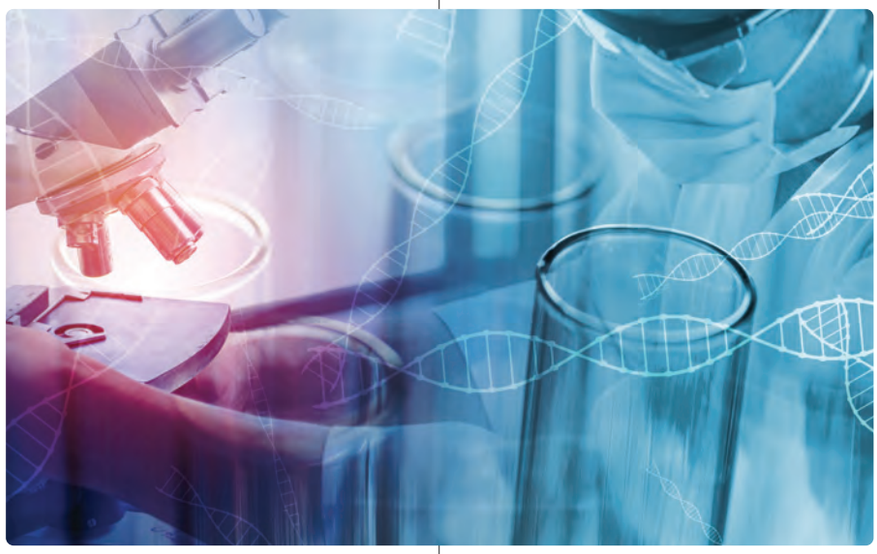
DNA methylation influences how genes are expressed.

Healthy methylation allows healthy gene expression to support youthful cell function.

Unhealthy methylation patterns result in deleterious gene expression that facilitates the onset of degenerative illness and shortened lifespan.[35-37]

As we age, our pattern of gene expression changes. By following changes in DNA methylation, we can indirectly follow changes in gene expression and, therefore, changes in biological age.

The first epigenetic aging "clock" was developed by UCLA researcher Dr. Steve Horvath, who assessed the methylation status of a broad array of tissue and cell types, finally settling on 353 specific DNA sites whose methylation is correlated with chronological age.



The TRIIM trial used Dr. Horvath's original epigenetic clock, as well as three other methylation clocks, to allow a robust analysis of the results of the treatment, and to confirm that different epigenetic analyses agreed, on average, on the impact of the intervention.[1]

Results of TRIIM Trial

By combining **metformin** and **DHEA** with **growth hormone** for just one year, the thymic benefits of growth hormone occurred with no significant side effects and the unexpected benefit of a **2.5-year biological age-reversal** in all patients, according to an average of the four **epigenetic clocks**.[1]

Remarkably, although these four clocks depend differently on blood composition and other factors, and although there were some quantitative differences in results between the different clocks, each clock produced results that were essentially the same as all the others with respect to epigenetic aging reversal.

Each clock, by itself, showed highly statistically significant results. In combination, the evidence for **aging reversal** across all clocks was overwhelming.

Interestingly, the average age reversal of 2.5 years was mirrored almost exactly by the original Horvath DNAm clock result. The DNAm clock for blood is known to correlate with aging of the brain, muscle, and other tissues, supporting a global aging reversal effect of the TRIIM protocol.

Summary

Regenerating thymic function, improving immunity, reversing epigenetic aging, and the other favorable effects seen in the **TRIIM trial** are required if we are to advance toward a more youthful state.

Dr. Greg Fahy's company, Intervene Immune, Inc., is seeking to replicate and extend these results in a larger clinical trial that is expected to launch in the first quarter of 2020. The second phase of the clinical trial will not only have many more study subjects, but will also implement more tests, such as clinically significant and hopefully FDA-approvable health endpoints and will include women, minorities, older and younger participants, and those with imperfect health, as well as a control comparator group.

Life Extension® has long advocated for use of several of the various interventions used in the TRIIM trial. These include **DHEA** and **metformin**. For those who don't take metformin, we have discovered other **AMPK-activating** compounds. Most readers of this publication utilize these and other methods to support healthy, youthful immunity and DNA.

However, we have not previously recommended hGH, or the combination of hGH, metformin, and DHEA, which breaks new ground, and we welcome this advance.

Dr. Fahy's group is seeking to identify an affordable source of growth hormone as well as other ways to make this longevity protocol available to almost everyone. For more information, see **www.interveneimmune.com**.

We applaud Dr. Greg Fahy, his team, and all the researchers involved for their arduous and excellent work in this historical clinical trial!

Look forward to future updates!

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

References

1. Fahy GM, Brooke RT, Watson JP, et al. Reversal of epigenetic aging and immunosenescent trends in humans. *Aging Cell*. 2019;18(6):e13028.
2. Abbott A. First hint that body's 'biological age' can be reversed. *Nature.* 2019 Sep;573(7773):173.
3. Available at: https://www.youtube.com/watch?v=ZGLL77wYxe8. Accessed November 29, 2019.
4. Available at: https://wiley.altmetric.com/details/66240556. Accessed December 12, 2019.
5. Available at: https://www.forbes.com/sites/robinseatonjefferson/2019/09/09/cocktail-of-drugs-gives-first-hope-that-biological-age-can-be-reversed/. Accessed November 29, 2019.
6. Palmer S, Albergante L, Blackburn CC, et al. Thymic involution and rising disease incidence with age. *Proceedings of the National Academy of Sciences*. 2018;115(8):1883-8.
7. Rezzani R, Nardo L, Favero G, et al. Thymus and aging: morphological, radiological, and functional overview. *Age (Dordr)*. 2014 Feb;36(1):313-51.
8. Arnold CR, Wolf J, Brunner S, et al. Gain and loss of T cell subsets in old age—age-related reshaping of the T cell repertoire. *J Clin Immunol.* 2011 Apr;31(2):137-46.
9. Naylor K, Li G, Vallejo AN, et al. The influence of age on T cell generation and TCR diversity. *J Immunol*. 2005 Jun 1;174(11):7446-52.
10. Ventevogel MS, Sempowski GD. Thymic rejuvenation and aging. *Curr Opin Immunol.* 2013 Aug;25(4):516-22.
11. Ferrando-Martinez S, Romero-Sanchez MC, Solana R, et al. Thymic function failure and C-reactive protein levels are independent predictors of all-cause mortality in healthy elderly humans. *Age (Dordr).* 2013 Feb;35(1):251-9.
12. Napolitano LA, Lo JC, Gotway MB, et al. Increased thymic mass and circulating naive CD4 T cells in HIV-1-infected adults treated with growth hormone. *Aids*. 2002 May 24;16(8):1103-11.
13. Taub DD, Murphy WJ, Longo DL. Rejuvenation of the aging thymus: growth hormone-mediated and ghrelin-mediated signaling pathways. *Current opinion in pharmacology*. 2010;10(4):408-24.
14. Savino W. Neuroendocrine control of T cell development in mammals: role of growth hormone in modulating thymocyte migration. *Exp Physiol*. 2007 Sep;92(5):813-7.
15. Harman SM, Blackman MR. Use of growth hormone for prevention or treatment of effects of aging. *J Gerontol A Biol Sci Med Sci*. 2004 Jul;59(7):652-8.
16. Marcus R, Butterfield G, Holloway L, et al. Effects of short term administration of recombinant human growth hormone to elderly people. *J Clin Endocrinol Metab.* 1990 Feb;70(2):519-27.
17. Svensson J, Bengtsson BA. Safety aspects of GH replacement. *Eur J Endocrinol.* 2009 Nov;161 Suppl 1:S65-74.
18. Gong S, Gao X, Xu F, et al. Association of lymphocyte to monocyte ratio with severity of coronary artery disease. *Medicine*. 2018;97(43):e12813-e.
19. Wang Q, Ma J, Jiang Z, et al. Association of lymphocyte-to-monocyte ratio with in-hospital and long-term major adverse cardiac and cerebrovascular events in patients with ST-elevated myocardial infarction. *Medicine.* 2017;96(34):e7897-e.
20. Hu P, Shen H, Wang G, et al. Prognostic significance of systemic inflammation-based lymphocyte- monocyte ratio in patients with lung cancer: based on a large cohort study. *PLoS One.* 2014;9(9):e108062.
21. Caglayan V, Onen E, Avci S, et al. Lymphocyte-to-monocyte ratio is a valuable marker to predict prostate cancer in patients with prostate specific antigen between 4 and 10 ng/dl. *Arch Ital Urol Androl*. 2019 Jan 17;90(4):270-5.
22. Camacho-Pereira J, Tarrago MG, Chini CCS, et al. CD38 Dictates Age-Related NAD Decline and Mitochondrial Dysfunction through an SIRT3-Dependent Mechanism. *Cell Metab*. 2016 Jun 14;23(6):1127-39.
23. Yang J, Zhang L, Yu C, et al. Monocyte and macrophage differentiation: circulation inflammatory monocyte as biomarker for inflammatory diseases. *Biomarker Research*. 2014 2014/01/07;2(1):1.
24. Samson LD, Boots AMH, Verschuren WMM, et al. Frailty is associated with elevated CRP trajectories and higher numbers of neutrophils and monocytes. *Exp Gerontol.* 2019 Oct 1;125:110674.
25. Johnson S, Imai SI. NAD (+) biosynthesis, aging, and disease. *F1000Res*. 2018;7:132.
26. Salmaninejad A, Valilou SF, Shabgah AG, et al. PD-1/PD-L1 pathway: Basic biology and role in cancer immunotherapy. *J Cell Physiol.* 2019 Aug;234(10):16824-37.
27. Ardolino L, Joshua A. Immune checkpoint inhibitors in malignancy. *Australian prescriber.* 2019;42(2):62-7.
28. Suzuki S, Akiyoshi T, Oba K, et al. Comprehensive Comparative Analysis of Prognostic Value of Systemic Inflammatory Biomarkers for Patients with Stage II/III Colon Cancer. *Ann Surg Oncol.* 2019 Nov 12.
29. Bouassida M, Zribi S, Krimi B, et al. C-reactive Protein Is the Best Biomarker to Predict Advanced Acute Cholecystitis and Conversion to Open Surgery. A Prospective Cohort Study of 556 Cases. *J Gastrointest Surg*. 2019 Nov 25.
30. Straatman J, Harmsen AM, Cuesta MA, et al. Predictive Value of C-Reactive Protein for Major Complications after Major Abdominal Surgery: A Systematic Review and Pooled-Analysis. *PLoS One*. 2015;10(7):e0132995.
31. Available at: https://www.hopkinsmedicine.org/heart_vascular_institute/clinical_services/centers_excellence/womens_cardiovascular_health_center/patient_information/health_topics/c_reactive_protein.html. Accessed December 4, 2019.
32. Ridker PM. A Test in Context: High-Sensitivity C-Reactive Protein. *J Am Coll Cardiol*. 2016 Feb 16;67(6):712-23.
33. Levine ME, Lu AT, Quach A, et al. An epigenetic biomarker of aging for lifespan and healthspan. *Aging (Albany NY)*. 2018 Apr 18;10(4):573-91.
34. Lu AT, Quach A, Wilson JG, et al. DNA methylation GrimAge strongly predicts lifespan and healthspan. *Aging*. 2019;11(2):303-27.
35. Johnson AA, Akman K, Calimport SRG, et al. The role of DNA methylation in aging, rejuvenation, and age-related disease. *Rejuvenation research.* 2012;15(5):483-94.
36. Xiao FH, Kong QP, Perry B, et al. Progress on the role of DNA methylation in aging and longevity. *Brief Funct Genomics.* 2016 Nov;15(6):454-9.
37. Mahmoud AM, Ali MM. Methyl Donor Micronutrients that Modify DNA Methylation and Cancer Outcome. *Nutrients.* 2019;11(3):608.

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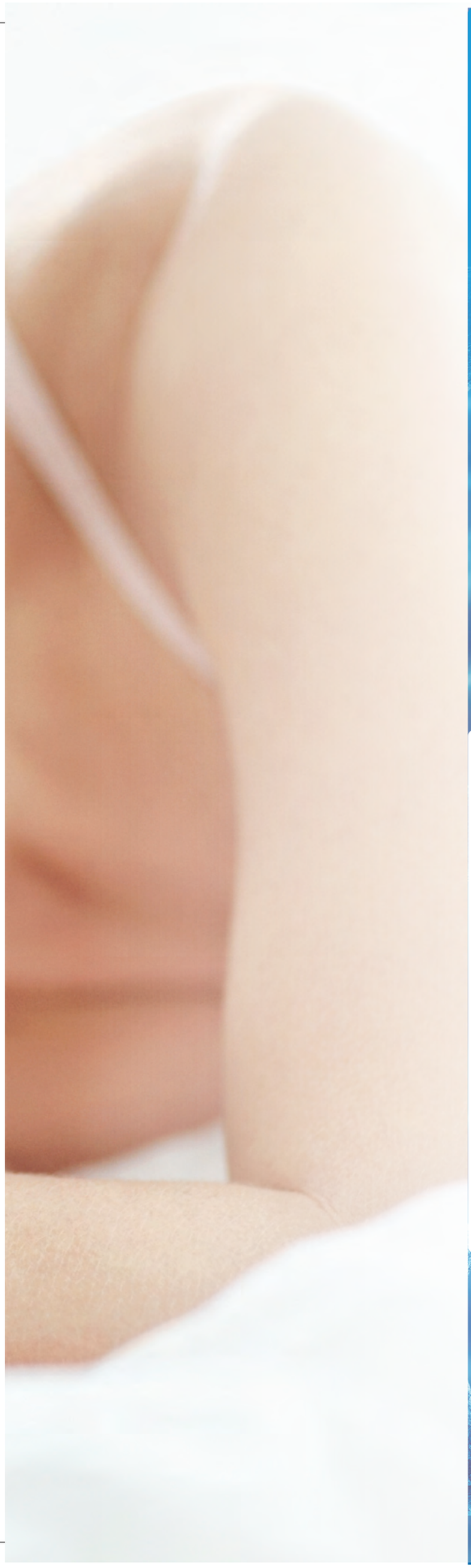


Topical Probiotic-Fermented Complex Protects the Skin

BY ROBERT GOLDFADEN AND GARY GOLDFADEN, MD

Many think of **probiotics** and beneficial microorganisms only as related to gut health.

But bacteria on our skin are important contributors to dermatological health and appearance.[1-3]

Aging, overuse of facial cleansers, and anti-bacterial soaps, disrupt the delicate balance between good and bad bacteria on the skin.[4,5]

This contributes to premature skin aging.

Fermentation products of *Aspergillus* and the **probiotic** *Lactobacillus* produce substrates that have been shown to rebalance skin flora and promote **DNA repair**. The result is more youthful, vibrant skin.

The Skin Microbiota

The skin's surface is home to diverse and complex microbial communities collectively known as the skin microbiota.[6,7]

Most of these bacteria work on our behalf.

Researchers are discovering their unique ability to provide an optimized inflammatory response that eradicates pathogens, mitigates harmful effects of sun exposure, and maintains a well-hydrated and intact barrier function.[8-12]

Aging, stress, and excessive washing create an imbalanced skin microbiome characterized by the depletion of good bacteria and multiplication of bad bacteria.[13,14]

Lactobacillus Ferment Rebalances Skin Flora

Scientists turned to one of the most well-recognized and proven probiotic bacterial groups, *Lactobacillus,* to rebalance an ailing skin microbiome.

Lactobacillus ferment promotes the growth of beneficial lactic acid bacteria. It also suppresses the colonization by pathogenic bacteria, through the synthesis of anti-microbial peptides called **bacteriocins**.[15-18] In the laboratory, *Lactobacillus* ferment significantly reduced the reproduction of multiple bacterial species, including *S. aureus* associated with chronic inflammatory skin diseases.[19-22]

By limiting the growth of bad bacteria, while still allowing friendly bacteria to flourish, *Lactobacillus* ferment restores the skin flora to a healthy, balanced state. This, in turn, normalizes immune function and controls inflammation to help the skin regain youthful function and appearance.

Lactobacilli also synthesize free fatty acids during the fermentation process, which promotes a slightly acidic environment in the skin, conducive to anti-microbial defense, barrier function regeneration, and moisture retention.[23]

A recent clinical study showcased the hydrating properties of *Lactobacillus* ferment. When topically applied for four weeks, it was shown to increase participants' skin moisture by **10%** compared to baseline.[22] This finding is noteworthy, as boosting moisture in the skin increases volume and fullness that diminishes the appearance of wrinkles and fine lines.

Let's now look at how *Aspergillus* ferment protects against UV-induced damage to skin cells and supports DNA repair.

Aspergillus Ferment Promotes DNA Protection and Repair

Sun exposure generates a storm of destructive free radicals in the skin that cause cumulative DNA damage and contribute to the breakdown of structural proteins collagen and elastin, which ultimately leads to photoaging.[24-27]

Proanthocyanidins are polyphenols that combat UV-induced oxidative damage by blocking multiple inflammatory pathways and exerting potent antioxidant effects.[28,29]

Scientists discovered that *Aspergillus* ferment is rich in proanthocyanidins and can deliver greater concentrations of these beneficial compounds to the skin, and for a longer time period.[30]

As a result, *Aspergillus* ferment was shown to strengthen skin's antioxidant protection, exhibiting greater suppression of free radicals than the well-known endogenous antioxidant **superoxide dismutase** (SOD).[30]

This effect completely protected skin cells from DNA damage under UV-radiated and non-radiated conditions. *Aspergillus* ferment also repaired existing sun damage by producing greater activation in DNA reparative processes compared to a control.[30] These DNA-protective and DNA-repair effects lower skin cancer risk and increase the survival of healthy cells, to slow or even reverse cutaneous deterioration.

WHAT YOU NEED TO KNOW

Topical Skin Protection with Probiotic-Fermented Complex

- The skin's surface houses bacteria and other microorganisms collectively known as the skin microbiota.
- Most of these bacteria are harmless and beneficial, protecting against infection, chronic inflammation, and barrier dysfunction.
- Aging and excessive washing are among the numerous factors that cause an imbalance in the ratio of good to bad bacteria on the skin.
- *Lactobacillus* ferment rebalances skin flora and produces anti-microbial peptides called bacteriocins that limit the growth of bad bacteria.
- *Aspergillus* ferment is rich in proanthocyanidins that protect against and repair UV-induced DNA damage.
- These anti-aging compounds have now been combined into one topical serum that promotes healthy, youthful skin.

Summary

It's becoming increasingly clear that an unbalanced cutaneous microbiota compromises optimal skin health and appearance.

Aspergillus and *Lactobacillus* ferment have been shown to bring the skin back into a healthy equilibrium, while inhibiting UV-induced damage and boosting advanced DNA repair.

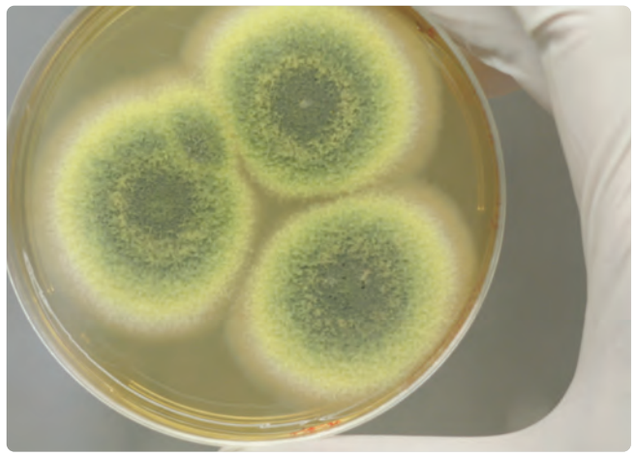
This combination has now been formulated into one topical serum to create fresher, healthier, younger-looking skin. •

Gary Goldfaden, MD, is a clinical dermatologist and lifetime member of the American Academy of Dermatology. He is the founder of Academy Dermatology in Hollywood, FL, and Cosmesis Skin Care. Dr. Goldfaden is a member of the **Life Extension**® Medical Advisory Board. All Cosmesis products are available online.

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

References

1. Byrd AL, Belkaid Y, Segre JA. The human skin microbiome. *Nat Rev Microbiol*. 2018 Mar;16(3):143-55.
2. Christensen GJ, Bruggemann H. Bacterial skin commensals and their role as host guardians. *Benef Microbes*. 2014 Jun 1;5(2):201-15.
3. Egert M, Simmering R. The Microbiota of the Human Skin. *Adv Exp Med Biol*. 2016;902:61-81.
4. Shibagaki N, Suda W, Clavaud C, et al. Aging-related changes in the diversity of women's skin microbiomes associated with oral bacteria. *Sci Rep.* 2017 Sep 5;7(1):10567.
5. Yu JJ, Manus MB, Mueller O, et al. Antibacterial soap use impacts skin microbial communities in rural Madagascar. *PLoS One.* 2018;13(8):e0199899.
6. Grice EA, Segre JA. The skin microbiome. *Nat Rev Microbiol*. 2011 Apr;9(4):244-53.
7. Findley K, Grice EA. The skin microbiome: a focus on pathogens and their association with skin disease. *PLoS Pathog.* 2014 Oct;10(10):e1004436.
8. Cogen AL, Yamasaki K, Sanchez KM, et al. Selective antimicrobial action is provided by phenol-soluble modulins derived from Staphylococcus epidermidis, a normal resident of the skin. *J Invest Dermatol.* 2010 Jan;130(1):192-200.
9. Cogen AL, Yamasaki K, Muto J, et al. Staphylococcus epidermidis antimicrobial delta-toxin (phenol-soluble modulin-gamma) cooperates with host antimicrobial peptides to kill group A Streptococcus. *PLoS One.* 2010 Jan 5;5(1):e8557.
10. Lai Y, Di Nardo A, Nakatsuji T, et al. Commensal bacteria regulate Toll-like receptor 3-dependent inflammation after skin injury. *Nat Med.* 2009 Dec;15(12):1377-82.
11. Lai Y, Cogen AL, Radek KA, et al. Activation of TLR2 by a small molecule produced by Staphylococcus epidermidis increases antimicrobial defense against bacterial skin infections. *J Invest Dermatol.* 2010 Sep;130(9):2211-21.
12. Patra V, Wagner K, Arulampalam V, et al. Skin Microbiome Modulates the Effect of Ultraviolet Radiation on Cellular Response and Immune Function. *iScience.* 2019 May 31;15:211-22.
13. Wallen-Russell C. The Role of Every-Day Cosmetics in Altering the Skin Microbiome: A Study Using Biodiversity. *Cosmetics.* 2018;6(1):2.
14. Prescott SL, Larcombe D-L, Logan AC, et al. The skin microbiome: impact of modern environments on skin ecology, barrier integrity, and systemic immune programming. *The World Allergy Organization journal*. 2017;10(1):29-.
15. Perez RH, Zendo T, Sonomoto K. Novel bacteriocins from lactic acid bacteria (LAB): various structures and applications. *Microb Cell Fact.* 2014 Aug 29;13 Suppl 1:S3.
16. Bastos MC, Ceotto H, Coelho ML, et al. Staphylococcal antimicrobial peptides: relevant properties and potential biotechnological applications. *Curr Pharm Biotechnol.* 2009 Jan;10(1):38-61.
17. Cogen AL, Nizet V, Gallo RL. Skin microbiota: a source of disease or defence? *Br J Dermatol.* 2008 Mar;158(3):442-55.
18. Bierbaum G, Gotz F, Peschel A, et al. The biosynthesis of the lantibiotics epidermin, gallidermin, Pep5 and epilancin K7. *Antonie Van Leeuwenhoek.* 1996 Feb;69(2):119-27.
19. Totte JE, van der Feltz WT, Bode LG, et al. A systematic review and meta-analysis on Staphylococcus aureus carriage in psoriasis, acne and rosacea. *Eur J Clin Microbiol Infect Dis.* 2016 Jul;35(7):1069-77.
20. Balci DD, Duran N, Ozer B, et al. High prevalence of Staphylococcus aureus cultivation and superantigen production in patients with psoriasis. *Eur J Dermatol*. 2009 May-Jun;19(3):238-42.
21. Fry L, Baker BS. Triggering psoriasis: the role of infections and medications. Clin Dermatol. 2007 Nov-Dec;25(6):606-15.
22. Product Monograph: Leucidal®Liquid SF. Active Micro Technologies. 2019.
23. Yadav H, Jain S, Sinha PR. Production of free fatty acids and conjugated linoleic acid in probiotic dahi containing Lactobacillus acidophilus and Lactobacillus casei during fermentation and storage. *International Dairy Journal.* 2007 2007/08/01/;17(8):1006-10.
24. Emerit I. Free radicals and aging of the skin. *EXS*. 1992;62:328-41.
25. Poljsak B, Dahmane R. Free radicals and extrinsic skin aging. *Dermatol Res Pract.* 2012;2012:135206.
26. Fisher GJ. The pathophysiology of photoaging of the skin. *Cutis*. 2005 Feb;75(2 Suppl):5-8; discussion -9.
27. Pandel R, Poljsak B, Godic A, et al. Skin photoaging and the role of antioxidants in its prevention. *ISRN Dermatol.* 2013 Sep 12;2013:930164.
28. Mantena SK, Katiyar SK. Grape seed proanthocyanidins inhibit UV-radiation-induced oxidative stress and activation of MAPK and NF-kappaB signaling in human epidermal keratinocytes. *Free Radic Biol Med*. 2006 May 1;40(9):1603-14.
29. Yang L, Xian D, Xiong X, et al. Proanthocyanidins against Oxidative Stress: From Molecular Mechanisms to Clinical Applications. *Biomed Res Int.* 2018;2018:8584136.
30. Product Monograph: Nucleolys® DNA Protector. *Green Tech.* 2019.



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Breakfast: The Cookbook

BY EMILY ELYSE MILLER

Some consider breakfast to be the most important meal of the day. Some simply grab a sugar-laden pastry to eat "on the go." Others skip it altogether.

But for breakfast expert Emily Elyse Miller, breakfast is "sacred," bringing back some of the sweetest memories of her childhood. That love of morning foods has followed her into adulthood, where she has traveled the world, exploring other cultures through the lens of people's morning routines.

It inspired her to start a global culinary series called BreakfastClub in 2015 and to curate guided breakfast tours in cities across the world.

Breakfast: The Cookbook is the result of years of extensive travel and research, boiled down to a collection of 380 recipes that represent the best of breakfast specialties from 80 countries around the globe.

The dishes range from Mexican huevos rancheros, to Jamaican green banana porridge, to a full English breakfast. Each recipe also has helpful icons to identify it as vegan, vegetarian, gluten-free, or dairy-free.

Miller's hope is that, "These recipes should encourage everyone to explore and travel the world through breakfast, connecting us at breakfast tables near and far."

On the following pages, ***Life Extension*®** **Magazine** highlights four of these international morning recipes.

—LAURIE MATHENA

Rolled Flatbread Omelet Sandwich

UGANDA

Preparation time: 15 minutes, plus 30 minutes resting time
Cooking time: 20 minutes
Serves: 2

FOR THE CHAPATI:

½ cup (70 g) all-purpose (plain) flour

Pinch of salt

4 tablespoons warm water

Vegetable oil, for brushing

FOR THE OMELET:

4 eggs

½ cup (35 g) shredded green cabbage

4 tablespoons diced red onion

½ medium tomato, diced

Salt and freshly ground pepper

2 tablespoons vegetable oil

Chili sauce, for serving

Make the chapati:
In a medium bowl, combine the flour and salt. Slowly incorporate the warm water and stir with a wooden spoon until a shaggy dough forms. Transfer the dough to a floured work surface and knead with your hands until the dough is smooth, 10 minutes.

If the dough is too wet, add a sprinkle more of flour. If it is too dry, add a touch more water and knead again until smooth. Cover with a tea towel and allow the dough to rest for 30 minutes.

Divide the dough in half and roll into individual balls. On a lightly floured work surface, use a rolling pin to roll out the balls into rounds, ¼ inch (6 mm) thick. Brush both sides of each chapati with some of the vegetable oil. Heat a frying pan or cast-iron skillet over medium heat. Cook one side of the chapati until it begins to brown and bubble, about 1 minute.

Flip the chapati and cook for 30 seconds more or until brown spots appear and the bread is cooked through. Transfer to a tea towel and cover. Repeat for the second piece of dough. Set the frying pan aside for the omelet.

Make the omelet:
Crack the eggs into a bowl. Whisk in the cabbage, onion, and tomato. Season with salt and pepper.

In the reserved frying pan, heat 1 tablespoon of oil over medium heat. Pour half of the egg mixture into the pan and use a spatula to spread it out, but no larger than the diameter of the chapati. Allow the egg to cook and set on the bottom, about 30 seconds. Flip, using the spatula, and cook for 30 seconds more. Top the cooked egg pancake with a chapati.

Flip the chapati and egg out of the pan egg-side up onto a plate. Roll it up into a wrap. Repeat with the remaining 1 tablespoon oil and remaining egg mixture to make a second omelet.

Roll with the remaining chapati. Serve with chili sauce.

Chickpea and Torn Bread Stew

TUNISIA

Preparation time: 10 minutes, plus 4 hours soaking time
Cooking time: 1 hour 10 minutes
Serves: 2-4

1 cup (200 g) dried chickpeas (see Note), soaked for at least 4 hours and drained

Salt and freshly ground black pepper

1 tablespoon olive oil

1 small onion, chopped

3 cloves garlic, minced

1 teaspoon ground cumin

1 tablespoon harissa, or to taste

1 tablespoon lemon juice

2 cups (70 g) torn stale bread

2 Poached eggs

FOR SERVING (optional):

Capers

Chopped onions

Cilantro (coriander) leaves

Parsley leaves

Canned tuna

Olive oil, for drizzling

Make the stew:
In a medium saucepan, combine the chickpeas and 4 cups (950 ml/32 fl oz) water and bring to a boil over high heat. Season with salt to taste, reduce to a simmer, and cook the chickpeas until tender, about 1 hour. Drain, reserving 1 tablespoon liquid, and return the chickpeas to the saucepan.

In a medium frying pan, heat the oil over medium heat. Add the onion, season with salt, and cook until soft and translucent, about 5 minutes. Stir in the garlic, sprinkle the cumin over everything, and stir to coat.

Season with more salt and pepper to taste. Add the reserved chickpea cooking liquid or 1 tablespoon water and cook, scraping up any browned bits.

Transfer the onion-garlic mixture to the saucepan of chickpeas. Stir in the harissa. Remove from the heat and stir in the lemon juice.

To serve:
Place torn bread in a bowl and pour the chickpea mixture on top to soak the bread. Top with the poached eggs. If desired, serve with an assortment of capers, raw onions, cilantro, parsley, tuna, and a drizzle of olive oil.

Note: You can make this with 1½ to 2 cups (245g to 330g) canned chickpeas, liquid reserved from the can. Omit the first step. Saute the onion/garlic mixture as directed. Place the chickpeas in a saucepan and add the onion/garlic mixture and 2 cups (475 ml/16 fl oz) water.

Simmer uncovered for 15-20 minutes to reduce the water by half. Stir in the harissa. Remove from the heat and stir in the lemon juice. Using canned chickpeas will cut the prep time by 4 hours and the cook time by 50 minutes.

Savory Spiced Flatbread with Yogurt

INDIA

Preparation time: 20 minutes
Cooking time: 1 hour
Makes: 4 koki

- 1 cup (120 g) whole wheat (wholemeal) flour, plus more for dusting
- 1 teaspoon fine sea salt
- 1 small onion, diced
- 1 small hot green chili, finely chopped
- ½ teaspoon ground cumin
- ½ teaspoon anardana (dried pomegranate seeds), ground or whole
- ½ teaspoon freshly ground black pepper
- 1 tablespoon white sesame seeds, toasted
- 5 tablespoons cilantro (coriander) leaves, finely chopped
- 1 tablespoon dried fenugreek leaves (optional)
- 3 tablespoons melted ghee, oil, or butter, plus more for pan-frying
- Yogurt, for serving

In a medium bowl, combine the flours, salt, onion, green chili, cumin, anardana, black pepper, cilantro (coriander), fenugreek leaves (if using), and ghee, butter, or oil. Knead until you get a crumbly dough, then gradually add 3–4 tablespoons water and stir until a firm dough comes together. Knead in the bowl until it comes together in a firm ball. Divide the dough into 4 equal portions, dust with flour, and roll into balls.

Heat a cast-iron skillet over medium heat. Flatten each ball slightly and shape it into a round about 6 inches (15 cm) in diameter and 1/8 inch (6 mm) thick. Place in the hot pan and cook on both sides until lightly browned, about 8 minutes. Make small slits into the koki throughout the cooking process to vent heat from the pan and help the koki cook all the way through. Brush both sides with ghee or oil and continue to cook until browned, about 5 minutes. Repeat with the remaining koki.

Transfer to a plate. Serve with yogurt.

Israeli Breakfast Plate

ISRAEL

Preparation time: 40 minutes
Cooking time: 5 minutes
Serves: 2

- 4 Fried Eggs
- 2 tablespoons Schug (recipe follows)
- ½ cup (115 g) labneh, store-bought
- 1 cup (135 g) Middle Eastern Chopped Salad (recipe follows)
- 4 tablespoons olives
- 4 slices smoked salmon or lox, store-bought
- 2 slices challah, store-bought

Serve the fried eggs with schug, labneh, Middle Eastern chopped salad, olives, smoked salmon or lox (if using), and challah.

Schug

Preparation time: 15 minutes
Serves: 2

1 jalapeno chili, seeded

1 poblano chili, seeded

½ cup (10 g) cilantro (coriander), coarsely chopped

½ cup (10 g) parsley, coarsely chopped

2 cloves garlic, mashed

½ teaspoon ground cardamom (or seeds from 2 cardamom pods)

Salt and freshly ground pepper

3 tablespoons olive oil

In a food processor, combine the jalapeno, poblano, cilantro (coriander), parsley, garlic, cardamom, and salt and pepper to taste.

Pulse the mixture until chopped, then add the olive oil gradually as you pulse to emulsify the mixture. Pulse until the mixture is combined and completely smooth. Serve with everything.

Middle Eastern Chopped Salad

Preparation time: 15 minutes
Serves: 2

1 medium tomato, diced

2 mini cucumbers, diced

¼ red onion, finely diced

2 tablespoons finely chopped parsley

2 tablespoons lemon juice

3 tablespoons olive oil

Salt and freshly ground pepper

In a bowl, combine the tomato, cucumbers, onion, and parsley. Toss with the lemon juice and olive oil. Season with salt and pepper to taste.

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

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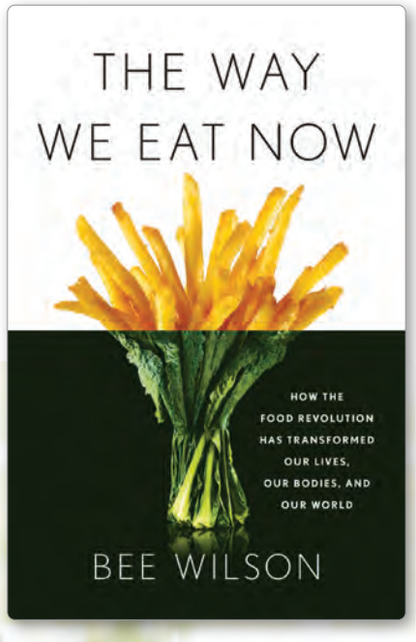
The Way We Eat Now:

How the Food Revolution has Transformed Our Lives, Our Bodies, and Our World

BY BEE WILSON

In general, the nutritional quality of what we eat when out is not the same as what we eat at home.



The world has undergone a bigger transition in the way we eat over the past 100 years than ever before in human history.

We've experienced easier access to food, more variety on a global level, and less hunger and starvation in many countries. At the same time, the abundance of food, and the type of food we're eating has given rise to diseases of modern, western civilization, like heart disease and type II diabetes.

For the first time in history, even when food is plentiful, the leading cause of mortality is poor diet.

In her latest book, *The Way We Eat Now*, food historian and award-winning food writer Bee Wilson explains how the food revolution has transformed our bodies and our world (both for good and for bad).

She details how the transition from savory foods to sweet ones, from home cooking to eating out, from meals to snacks, from independent food shops to supermarkets, and from fresh food to ultra-processed junk food is taking a toll on lives around the globe.

But Wilson believes we are on the cusp of another major food revolution that will bring about greater health and greater sustainability on a global level.

In this interview with ***Life Extension*® Magazine**, Wilson talks about how we got to where we are—and more importantly, how we can bring about the changes necessary for a healthier future.

—Laurie Mathena

LE: Can you paint a picture for us of "the way we eat now?"

Wilson: For most people across the world, life is getting better, but diets are getting worse. This is the bittersweet dilemma of eating in our times. Unhealthy food, eaten in a hurry, seems to be the price we pay for living in liberated, modern societies.

Millions of us enjoy lives that are freer and more comfortable than those our grandparents lived; a freedom underpinned by the amazing decline in global hunger. Yet our free and comfortable lifestyles are undermined by the fact that our food is killing us, not through its lack but through its abundance—a hollow kind of abundance.

What we eat now is a greater cause of disease and death in the world than either tobacco or alcohol. In 2015, around seven million people died from tobacco smoke and 3.3 million from causes related to alcohol, but 12 million deaths could be attributed to "dietary risks" such as those that arise from diets low in vegetables, nuts, whole grains, and seafood or diets high in salt (mostly from processed food) and sugary drinks.

Where humans used to live in fear of plague or tuberculosis, now the leading cause of mortality worldwide is diet. Most of our problems with eating come down to the fact that we have not yet adapted to the new realities of plenty, either biologically or psychologically.

LE: What is the paradox of being overfed and undernourished?

Wilson: As of 2006, for the first time the number of overweight and obese people in the world overtook the number who were underfed, in absolute terms. That year, 800 million individuals still did not have enough to eat, but more than one billion were overweight or obese.

To our hungry ancestors, having too much to eat might have looked like the gold at the end of the rainbow, but what these new calories are doing to our bodies is not a happy ending.

The problem isn't just that some people are overfed, and others are underfed. The new difficulty is that billions of people across the globe are simultaneously overfed and undernourished: rich in calories but poor in nutrients.

Our new global diet is replete with sugar and refined carbohydrates yet lacking in crucial micronutrients such as iron and trace vitamins.

Malnutrition is no longer just about hunger and stunting; it is also about obesity. The literal meaning of malnutrition is not hunger but bad feeding, which covers inadequate diets of many kinds.

LE: What are the consequences of malnutrition?

Wilson: Malnutrition in all its forms now affects one in three people on the planet.

Plenty of countries—including China, Mexico, India, Egypt, and South Africa—are suffering simultaneously from overfeeding and undernutrition, with many people suffering from a surfeit of calories but a dearth of the crucial micronutrients and protein a body needs to stay healthy.

As a result, not just in the West but across the world, people are suffering in growing numbers from diseases such as hypertension and stroke, type II diabetes, and preventable forms of cancer. The lead cause of these diseases is what nutritionists call "suboptimal diet" and what to the rest of us is simply "food."

Our ancestors could not rely on there being enough food. Our own food fails us in different ways. We have markets heaving with bounty, but too often what is sold as "food" fails in its basic task: to nourish us.

LE: We can't talk about "the way we eat now" without mentioning the way our ancestors ate "then." How have eating habits changed over the course of history?

Wilson: One way to think about human history is as a series of diet transitions, with each stage driven by

changes in the economy and society, as well as shifts in technology, climate, and population.

In the beginning, we were hunter-gatherers, eating a mostly low-fat diet of varied wild greens, berries, and wild animals. Stage two, starting around 20,000 BCE, was the agricultural age, which was characterized by a switch to staple cereals and a huge increase in population.

In Europe, we could go back a mere couple of hundred years to the third stage. During this period, advances in agriculture, such as crop rotation and fertilizer, led to a more varied and plentiful diet, with fewer starch-based staples and a bigger variety of vegetables along with animal protein.

LE: What makes our current stage—stage four—different from the rest?

Wilson: One of the frightening things about stage four has been how fast it has happened. It took thousands of years to get from a hunter-gatherer society to one based on farming (from stage one to stage two).

The effects of the Industrial Revolution in Europe and the United States took only a couple of centuries (stage two to stage three). But the new shifts in the West away from home-cooked meals and tap water and on to packaged snacks and sugary drinks were speedier still, taking only a couple of decades.

This era is different in quality from any of the other stages. Suddenly, the diet changes much more rapidly, with consequences for human health that are more extreme.

The economy shifts away from manual labor and toward mechanization, people move from the countryside to cities, and they start to expend less energy. There are

revolutions in food processing and marketing, and people start to eat more fat, more meat, and more sugar, with far less fiber.

Stage four sees human life expectancy hit new highs with the decline of deficiency diseases and the wonders of modern medicine. But it also sees populations suffering from diet-related chronic illness as never before.

This "nutrition transition" happened all over the Western world in the decades after the Second World War and is now happening even faster among low- and middle-income nations in the rest of the world. This transition explains why our food is sickening us now, through excess rather than hunger.

LE: Another major change in recent years has been the rise in eating out (as opposed to cooking at home). Why is this problematic?

Wilson: In general, the nutritional quality of what we eat when out is not the same as what we eat at home. Analysis by the USDA in the 1970s found that the nutrient quality of food eaten out in the United States tended to be significantly lower in vitamins and higher in calcium and fat than food eaten at home.

Back in the 1970s, this didn't matter for the overall quality of American diets, because eating out was still a rare treat back then. It is different now that ever-more meals in the week are eaten out. The nutrients that we get—or don't get—from these meals starts to matter more.

LE: What is one major obstacle keeping people from consuming a healthier diet?

Wilson: When it comes to choosing healthy foods, the dice are heavily loaded against consumers on low incomes. Over the past thirty years, the cost of healthy foods has consistently risen faster than the price of junk foods. Fruits and vegetables have always been expensive to produce; crops such as bell peppers or spinach take a lot of water to grow and are by their very nature costly to ship and store.

The salient point, however, is not just that vegetables are expensive in absolute terms but that they are much more expensive than they used to be, relative to other foods.

In the United States from 1980 to 2011, it became more than twice as expensive for Americans to purchase fresh fruit and vegetables compared to purchasing sugary carbonated beverages. Energy-dense foods such as cakes and burgers have become far cheaper now in comparison to fruits and vegetables.

LE: How is the government of Chile stepping in to change the destructive patterns of eating in its country?

Wilson: As of 2016, Chile had the highest average consumption of sugar-sweetened beverages on the planet. More than half of the food purchased by the average household was ultra-processed, and Chileans had the second-highest rates of obesity in Latin America, after Mexico.

According to estimates by the Chilean Ministry of Health, around **66%** of Chilean adults were overweight or obese, when as recently as the 1980s it was more common to be malnourished.

All the Latin American countries have suffered the worst effects of the nutrition transition later than the United States or Europe but at an accelerated pace.

The difference was that as of 2016, Chile also enacted the most aggressive range of laws against unhealthy foods the world has yet seen. The government passed an **18%** tax on sugar-sweetened sodas, one of the highest sugar taxes to date. Schools in Chile are no longer allowed to sell ultra-processed foods such as chocolate or potato chips.

[But] the most striking aspect of the Chilean food laws has been the new food labeling requirements. It started in 2014 with a series of warning labels on children's foods such as flavored milks and highly sweetened yogurts and breakfast cereals.

Simple hexagonal labels announced "warning: high in sugar," "warning: high in salt," "warning: high in saturated fat," and "warning: high in calories."

By the standards of US food labeling, the messages were astonishingly blunt.

LE: What kind of impact have these changes had?

Wilson: There is no denying that the new laws have spurred the food industry into action. As many as **20%** of all food products for sale in Chile—more than 1,500 items—have been reformulated in response to the law, with sugars and fats reduced, in order that foods can avoid the dreaded black labels. Coca-Cola has said that **65%** of the drinks it sells in Chile are now low sugar or reduced sugar beverages.

LE: What's next for the nutrition transition?

Wilson: I remain hopeful that we can somehow fight our way through stage four of the nutrition transition to stage five. This stage would be characterized by people eating more vegetables and fruits and experiencing a rapid decline in degenerative diseases.

During this phase, greater knowledge of the links between diet and health would lead people to eat better diets. Phase five is where we would all like to be living and eating: a comfortable life with neither hunger nor disease, with delicious food but not an excess of it.

We will not reach this state, however, without outside help, which means that governments and other organizations will have to do their bit to reset the needle on food.

Changing the world in which we eat will require action on multiple fronts, from agriculture and better regulation of food markets to education and cooking lessons.

If history teaches anything it is that we won't always eat in the particular ways we do now. Here is the consolation of eating in these strange times: the best of it is better than anything that came before and the worst of it won't stay the same forever. •

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

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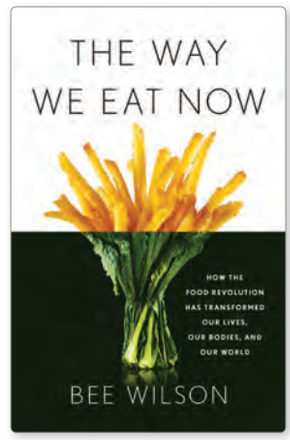

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00956 Pomegranate Fruit Extract
02024 Triple Action Blood Pressure AM/PM
02102 VenoFlow™

BONE HEALTH

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

BRAIN HEALTH

01524 Acetyl-L-Carnitine
01974 Acetyl-L-Carnitine Arginate
01008 Blast™
02321 Cognitex® Basics
02396 Cognitex® Elite
02397 Cognitex® Elite Pregnenolone
01659 Cognizin® CDP-Choline Caps
01540 DMAE Bitartrate (dimethylaminoethanol)
02006 Dopa-Mind™
02212 Focus Tea™
01658 Ginkgo Biloba Certified Extract™
01527 Huperzine A
00020 Lecithin Granules
02101 Memory Protect
00709 Migra-Eeze™
01603 Neuro-Mag® Magnesium L-Threonate Caps
02032 Neuro-Mag® Magnesium L-Threonate Powder
00888 Optimized Ashwagandha Extract
01676 PS (Phosphatidylserine) Caps
01327 Vinpocetine

CHOLESTEROL MANAGEMENT

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

DIGESTION SUPPORT

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

ENERGY MANAGEMENT

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

EYE HEALTH

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

FISH OIL & OMEGAS

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

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

FOOD

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

GLUCOSE MANAGEMENT

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

HEART HEALTH

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

HORMONE BALANCE

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

IMMUNE SUPPORT

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

INFLAMMATION MANAGEMENT

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

JOINT SUPPORT

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

KIDNEY & BLADDER SUPPORT

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

LIVER HEALTH & DETOXIFICATION

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

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

LONGEVITY & WELLNESS

00457 Alpha-Lipoic Acid
01625 AppleWise Polyphenol Extract
01214 Blueberry Extract
01438 Blueberry Extract with Pomegranate
02270 DNA Protection Formula
02119 GEROPROTECT® Ageless Cell™
02133 GEROPROTECT® Longevity A.I.™
02401 GEROPROTECT® Stem Cell
02211 Grapeseed Extract
02109 Mediterranean Whole Food Blend
00954 Mega Green Tea Extract (decaffeinated)
00953 Mega Green Tea Extract (lightly caffeinated)
01513 Optimized Fucoidan with Maritech® 926
02230 Optimized Resveratrol
01637 Pycnogenol® French Maritime Pine Bark Extract
02210 Resveratrol
00070 RNA (Ribonucleic Acid)
02301 Senolytic Activator
01208 Super R-Lipoic Acid
01919 X-R Shield

MEN'S HEALTH

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

MINERALS

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

MISCELLANEOUS

00577 Potassium Iodide
00657 Solarshield® Sunglasses

MOOD & STRESS MANAGEMENT

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

MULTIVITAMINS

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

NERVE & COMFORT SUPPORT

02202 ComfortMAX™
02303 PEA Discomfort Relief

PERSONAL CARE

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

PET CARE

01932 Cat Mix
01931 Dog Mix

PROBIOTICS

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

SKIN CARE

80157 Advanced Anti-Glycation Peptide Serum
80165 Advanced Growth Factor Serum
80170 Advanced Hyaluronic Acid Serum
80154 Advanced Lightening Cream
80155 Advanced Peptide Hand Therapy
80175 Advanced Probiotic-Fermented Eye Serum
80152 Advanced Triple Peptide Serum
80140 Advanced Under Eye Serum with Stem Cells
80137 All-Purpose Soothing Relief Cream
80139 Amber Self MicroDermAbrasion
80118 Anti-Aging Mask
80151 Anti-Aging Rejuvenating Face Cream
80153 Anti-Aging Rejuvenating Scalp Serum
80133 Anti-Oxidant Facial Mist Hydrator

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

SLEEP

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

VITAMINS

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

WEIGHT MANAGEMENT & BODY COMPOSITION

00658 7-Keto® DHEA Metabolite • 25 mg, 100 capsules
02479 7-Keto® DHEA Metabolite • 100 mg, 60 veg capsules
01509 Advanced Anti-Adipocyte Formula
01807 Advanced Appetite Suppress
02207 AMPK Metabolic Activator
01823 CalReduce Selective Fat Binder
02478 DHEA Complete
01738 Garcinia HCA
29754 HCActive Garcinia Cambogia Extract
01292 Integra-Lean®
01908 Mediterranean Trim with Sinetrol™ -XPur
01492 Optimized Irvingia with Phase 3™ Calorie Control Complex
01432 Optimized Saffron with Satiereal®
00818 Super CLA Blend with Sesame Lignans
01902 Waist-Line Control™
02151 Wellness Code® Appetite Control

WOMEN'S HEALTH

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

SUPER K

Comprehensive Vitamin K Formula!

Item #02334 • 90 softgels

1 bottle **$22.50**

4 bottles $20.25 each

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Each bottle lasts for three months.

Just one daily softgel of **Super K** provides:

Vitamin K1	**1,500 mcg**
Vitamin K2 (MK-4)	**1,000 mcg**
Vitamin K2 (*trans* MK-7)	**100 mcg**

For full product description and to order **Super K**, 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.

Most Complete Omega-3
FISH OIL FORMULA

Fish oil boosts blood levels of **EPA** and **DHA** omega-3 fatty acids.

Few people take enough **fish oil** to obtain **optimal** levels of **EPA/DHA**.

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

Our most advanced fish oil formula provides:

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

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

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

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Sharing guidance, knowledge and personalized health

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Progressive Discovery

Pursuing innovative formulas for the well-being of all

Passionate Excellence

Committed to creating our best, so you can live your healthiest

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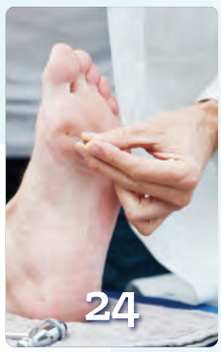

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