

# **Update: Prospects for an Improved Healthspan and Lifespan**

**March 20, 2026**

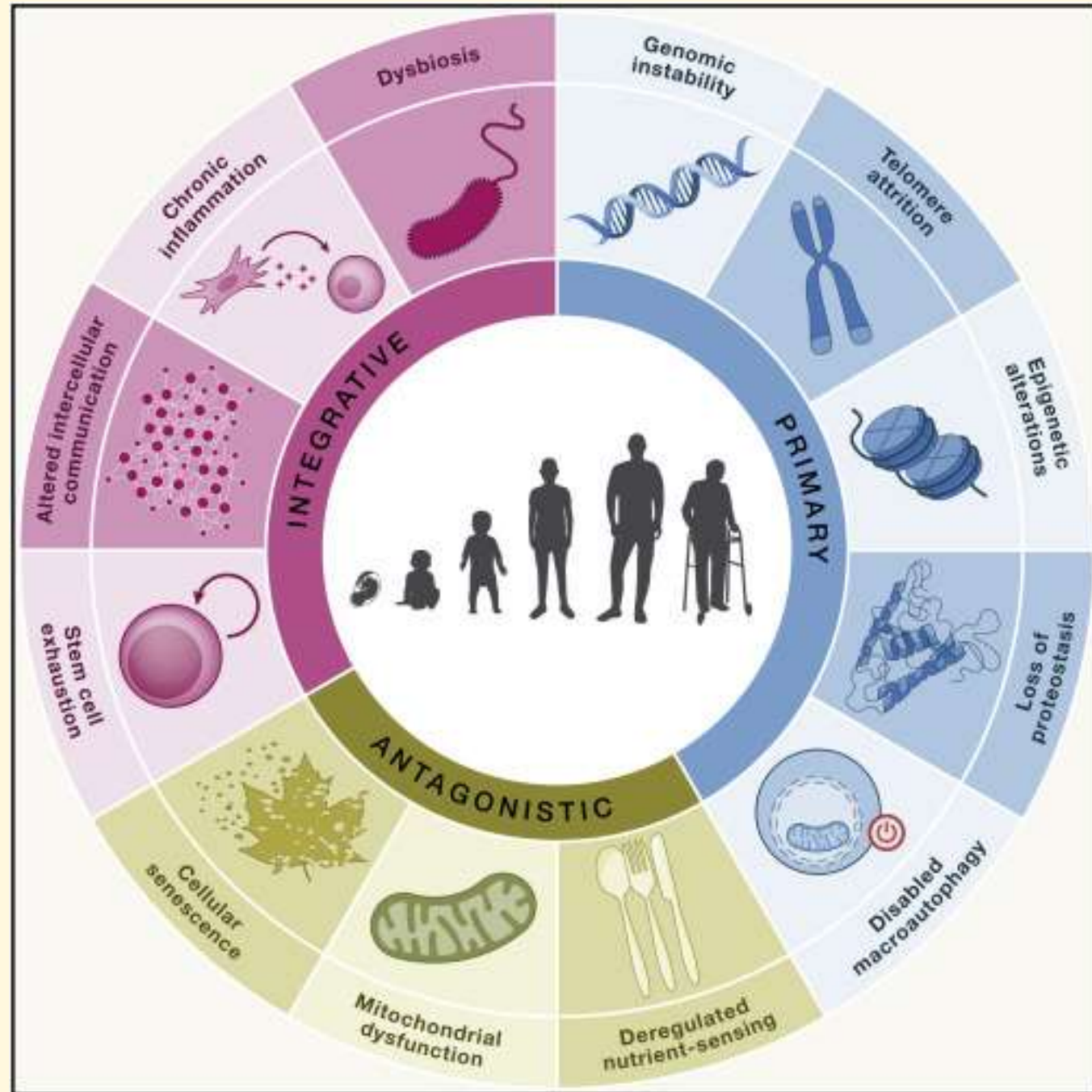
**Karl Blasius**

# What is Aging?: Its 12 Hallmarks

**Cell-Level changes associated with aging, or “common denominators of aging” in mammals.**

*The Hallmarks of Aging*, Carlos López-Otín, Maria A. Blasco, Linda Partridge, Manuel Serrano, Guido Kroemer, *Cell*, Vol 153, 2013.

*Hallmarks of aging: An expanding universe*, same authors, *Cell*, Vol 186, 2023.



# 3 Classes of Hallmarks

## 1. Primary Hallmarks (The Underlying Causes)

These are considered the "root causes" of cellular aging.

- **Genomic Instability:** Accumulation of DNA damage
- **Telomere Attrition:** The progressive shortening of protective chromosome caps (telomeres) with each cell division, leading eventually to cell death or senescence.
- **Epigenetic Alterations:** Changes in gene expression patterns (not the DNA sequence itself) that turn the "wrong" genes on or off as we age.
- **Loss of Proteostasis:** Failure of the mechanisms that ensure proteins are correctly folded and functional, leading to toxic protein
- **Disabled Macroautophagy:** A decline in the cell's ability to recycle its own damaged parts and waste products.

## 2. Antagonistic Hallmarks (The Protective Responses)

These processes initially serve protective roles but become harmful when they become chronic or exacerbated by primary damage.

- **Deregulated Nutrient-Sensing:** Decline in the cell's ability to sense and respond to food and energy levels, affecting growth and metabolism.
- **Mitochondrial Dysfunction:** Efficiency loss in the "powerhouses" of the cell, leading to decreased energy production and increased [oxidative stress](#).
- **Cellular Senescence:** Damaged cells stop dividing but don't die, lingering as "zombie cells" that secrete inflammatory signals to surrounding tissue.

# 3 Classes of Hallmarks continued

## 3. Integrative Hallmarks (The Systemic Consequences)

These represent the final functional decline resulting from the previous hallmarks.

- Stem Cell Exhaustion:** A reduction in the number and activity of stem cells, which limits the body's ability to repair and renew tissues.
- Altered Intercellular Communication:** Breakdown in how cells "talk" to each other, leading to systemic issues like "inflammaging".
- Chronic Inflammation:** A persistent, low-grade inflammatory state (inflammaging) that damages tissues and contributes to many age-related diseases.
- Dysbiosis:** An imbalance in the gut microbiome which affects overall immunity and metabolic health.

# Healthspan & Lifespan Extension: Progress Update

- Recent research and product development has accelerated the pace of understanding aging and age-associated diseases in us mammals.
- The news in this field has now grown exponentially for several years from trickle to torrent, powered by massive new investments in academia, startup businesses, and clinical trials.
- We now have access to numerous news reports, technical publications, and independent analyses of the significance of new developments. The field is clouded, however, by biased experts and AI-powered impersonations of well-known science communicators spouting words they did not author.
  - Dr. William Li, MD, an author of many books explaining cancer research and food as medicine recently recorded a short talk on his blog to disown numerous online AI impersonations, <https://www.youtube.com/watch?v=diR6TC1wfAQ>.
- Last year I reported on new tests and therapies entering or approaching clinical practice. This year I will focus on examples of excellent communicators of the torrent of new information, as we need to hear coherent scientific explanations and critiques.

# Nic Verhoeven, PhD Molecular Medicine (Cell Physiology)

Nic authors *Physionic*, a free Youtube blog, and additional materials (by subscription) containing detailed analyses of multiple research publications, clear explanations of mechanisms underlying the results, and a sprinkling of cheeky humor. “Learn your body, from the macro to the micro.”

- from December 2025: *A Supplement Actually Proven to Prevent Cancer!*, 10m50s, <https://www.youtube.com/watch?v=f60S4WpsRt4>
  - Features discussion of a blinded clinical trial of the effects of oral berberine (a compound extracted from plants, commonly used to manage blood sugar and cholesterol levels) on the development of colon polyps and colon cancer over 2 years of dosing plus six more years of followup and includes discussion of study strengths and weaknesses and the need for more research. Also, what might a reasonable person do with this information?

# Nic Verhoeven, PhD Molecular Medicine (Cell Physiology), continued

- from March 2026: *GlyNAC: The Most Promising Anti-Aging Supplement, but Most People Shouldn't use it*, 12m58s, <https://www.youtube.com/watch?v=J2Et3CYoQR4>
  - Older adults and sufferers of chronic illness (e.g. diabetes) are likely deficient in an important native antioxidant, glutathione. A mixture of two amino acids, glycine and cysteine, is proven to raise glutathione levels to healthy youthful levels, with measures of physical performance also improved.

# Nick Norwitz, MD PhD

Nick authors *nicknorwitzmdphd*, a Youtube video blog, and a newsletter, [StayCuriousMetabolism.com](http://StayCuriousMetabolism.com). “My motto is ‘Stay Curious’.” “Thanks for learning with me!” He enthusiastically translates and compares research publications for the nonspecialist, clarifying their importance for our metabolic health. Topics include diet, digestion, microbiome, cardio vascular health, liver health, blood sugar/insulin, brain health, and cancer in all phases of life.

from March 16, 2026: *Why Aging Muscles Shrink – And How to Stop It*, 15m21s, <https://www.youtube.com/watch?v=4wIOkLkx8f0>

Selection [0m to 10m19s] features discussion of the effects of age and exercise on muscle size and a study which yielded a puzzling answer. What is required for resilient fitness?

# Longevity Science News on Youtube

**“We think life is awesome, and the more of it in good health you get, the better. Our channel is all about healthy life extension, from every possible angle: from the science behind it to its social, demographic, and economical implications.” In this news blog the principal reporter, Emmett Short, enthusiastically covers recent news from research publications, conferences, and press releases with a good dash of humor. Social and economic implications are also discussed.**

**from January 31, 2026: *2026 Age Reversal: 5 Real Innovations To Stop Us Growing Old*, 15m3s, <https://www.youtube.com/watch?v=qPEJ1khUN2w&t=98s>**

**Selection [0m to 30s, 1m40s to 15m3s] features discussion of five classes of progress in healthspan science reported in the first month of 2026:**

- A genetic rejuvenation treatment enters an FDA registered clinical trial.**
- Several new cancer treatments and a diagnostic test suggest a revolution in oncology.**
- Regeneration of several human body parts.**
- A single dose for life weight loss drug treatment (GLP-1 gene therapy) is in development.**
- An apparent breakthrough in understanding the cause of MS, suggesting new approaches to treatment.**

# More Information

## I'm Currently Reading

**The Ageless Brain: How to Sharpen and Protect Your Mind for a Lifetime**

by Dale E. Bredesen, MD, 2025

## Physical Fitness, Rehab, and Physiology

- <https://www.youtube.com/@EmmaForeverYoga> by Emma, a yoga teacher in Australia who teaches muscle, joint, and nerve mechanisms along with stretching for mobility and strength
- <https://www.youtube.com/@DrAndreaFurlan> by Dr. Andrea Furlan, MD PhD, medical school professor in Toronto, Canada, a specialist in chronic pain, also provides a major resource for pain management and injury rehab at <https://www.doctorandreafulan.com/>

## • Human Behavior, Disease, and Food

- <https://drrichardjohnson.com/>
- <https://www.youtube.com/@DrWilliamLi>

## Ongoing Source of Information on Aging Science and Medicine

- *FoundMyFitness* Youtube channel by Rhonda Patrick PhD, <https://www.youtube.com/user/FoundMyFitness>