Healthy Aging for Healthy Eyes

Julie Poteet, OD, MS, CNS, FOWNS

Financial Disclosures

- **Part-time consultant for nutraceuticals by Bausch & Lomb**
- **Nutrition Writer and Clinical Editor for the journal *Presbyopia and the Aging Eye***
- **Frequent lecturer on nutrition and wellness for eye doctors**

Healthy Lifestyle Linked to Better Retinal Health

Hot Off the Press:

- **Key Takeaways**
- A healthy lifestyle correlates with reduced inflammation and improved retinal neurovascular health, as shown by a study using UK Biobank data.
- Higher healthy lifestyle scores are associated with lower risks of age-related macular degeneration and retinal vascular occlusion.
- Improved retinal metrics, such as artery-to-vein ratio and retinal nerve fiber layer thickness, are linked to better lifestyle scores.
- The INFLA-score indicates that reduced inflammation partially mediates the relationship between lifestyle and retinal health improvements.

Zeng X, Chen R, Zhang X, et al. Associations between a healthy lifestyle score and retinal neurovascular health. *Br J Ophthalmol.* 2025;published online 10 February. doi: 10.1136/bjo-2024-326184

Learning Objectives

- Identify current proposed theories of aging and the molecular, physiological, pathological, and psychological changes associated with aging
- Identify the concept of epigenetics and the role of lifestyle in influencing the way genes are expressed
- Identify inflammaging as a pathological mechanism behind chronic diseases of aging
- Discuss diet as a driver of chronic disease and the role of a Mediterranean diet in health

Learning Objectives Continued

- Identify and describe the 5 systems of defense against disease: angiogenesis, regeneration, microbiome, DNA protection, and immunity and ways to boost each defense system
- Describe the role of exercise in eye and brain health and walking as a gateway to healthy aging
- Identify other components of wellness such as gratitude, mindfulness, and the quality of relationships and how these can support healthy aging
- Putting it all together: evidence-based formula for wellness for doctors

Theories of Aging: Mechanisms and Clinical Implications

Introduction to Aging Theories

Aging is a complex biological process leading to gradual physiological decline.

Theories of aging can be categorized into:

- - Programmed Theories: Genetic and epigenetic regulation of aging.
- - Damage or Error Theories: Accumulation of molecular and cellular damage.

Understanding these mechanisms aids in developing anti-aging interventions.

da Costa JP, Vitorino R, Silva GM, Vogel C, Duarte AC, Rocha-Santos T. A synopsis on aging-Theories, mechanisms and future prospects. Ageing Res Rev. 2016 Aug;29:90-112. doi: 10.1016/j.arr.2016.06.005. Epub 2016 Jun 25. PMID: 27353257; PMCID: PMC5991498.

Programmed Theories of Aging

- Programmed Senescence Theory: Aging is genetically regulated via telomere shortening.
- Endocrine Theory: Hormonal changes contribute to aging-related decline.
- Immunological Theory: Decline in immune function (immunosenescence) increases disease susceptibility.

Damage or Error Theories of Aging

- Free Radical Theory: Oxidative stress damages cellular components.
- Mitochondrial Theory: Mitochondrial dysfunction contributes to aging.
- Error Catastrophe Theory: Accumulated genetic mutations lead to aging-related decline.

Integrating Theories and Future Perspectives

- Aging involves both genetic programming and environmental damage.
- Current research explores interventions targeting longevity pathways.
- Emerging therapies include gene editing, caloric restriction, and senolytics.

Molecular Changes in Aging

Genetic Factors:

•Heritability of Lifespan:

- Studies indicate that approximately 25–32% of the variability in human lifespan can be attributed to genetic differences.
- This underscores the significant role of genetics in determining longevity.

Gene Expression Alterations:

•Senescence-Associated Gene Expression:

- Senescent cells exhibit distinct gene expression profiles, with certain genes upregulated or downregulated compared to proliferating cells.
- These changes can affect various cellular functions, including cell cycle regulation, apoptosis, and stress responses.

Telomere Dynamics:

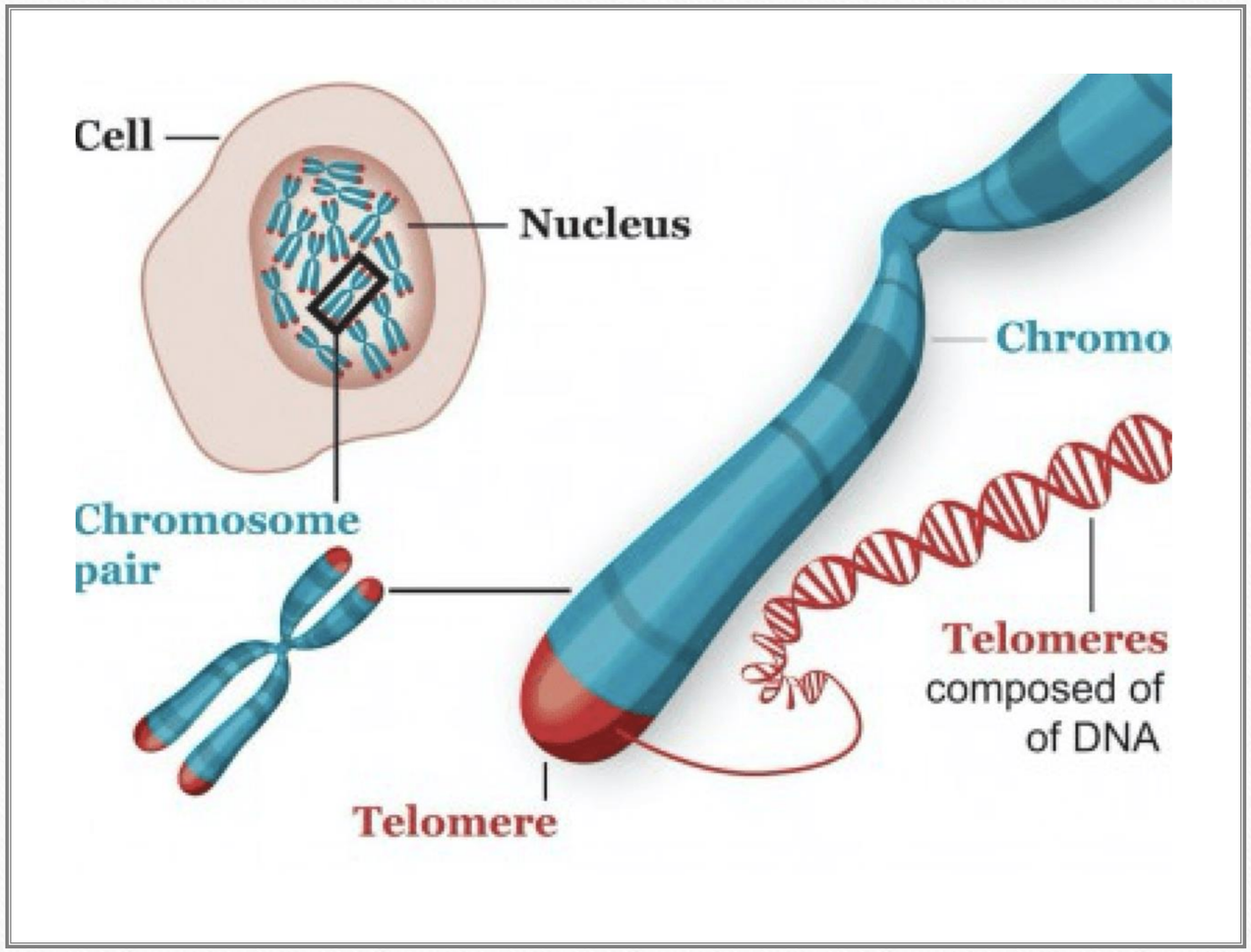
•Telomere Shortening:

- Telomeres, the protective caps at the ends of chromosomes, shorten with each cell division.
- Critically short telomeres trigger replicative senescence, halting further cell division.

Epigenetic Modifications:

•DNA Methylation and Histone Modification:

- Aging is associated with changes in DNA methylation patterns and histone modifications, leading to altered chromatin structure and gene expression.
- These epigenetic alterations can influence cellular aging and the development of age-related diseases.



Telomeres

- Telomeres are at the end of our chromosomes
- As they shorten, we age
- The key to longevity is to reduce the shortening of these telomeres.
- According to an NIH study, this may be a better indication of aging than chronological age

•NIH, Lu, w, Zhang Y, et al 2013

Per NIH studies

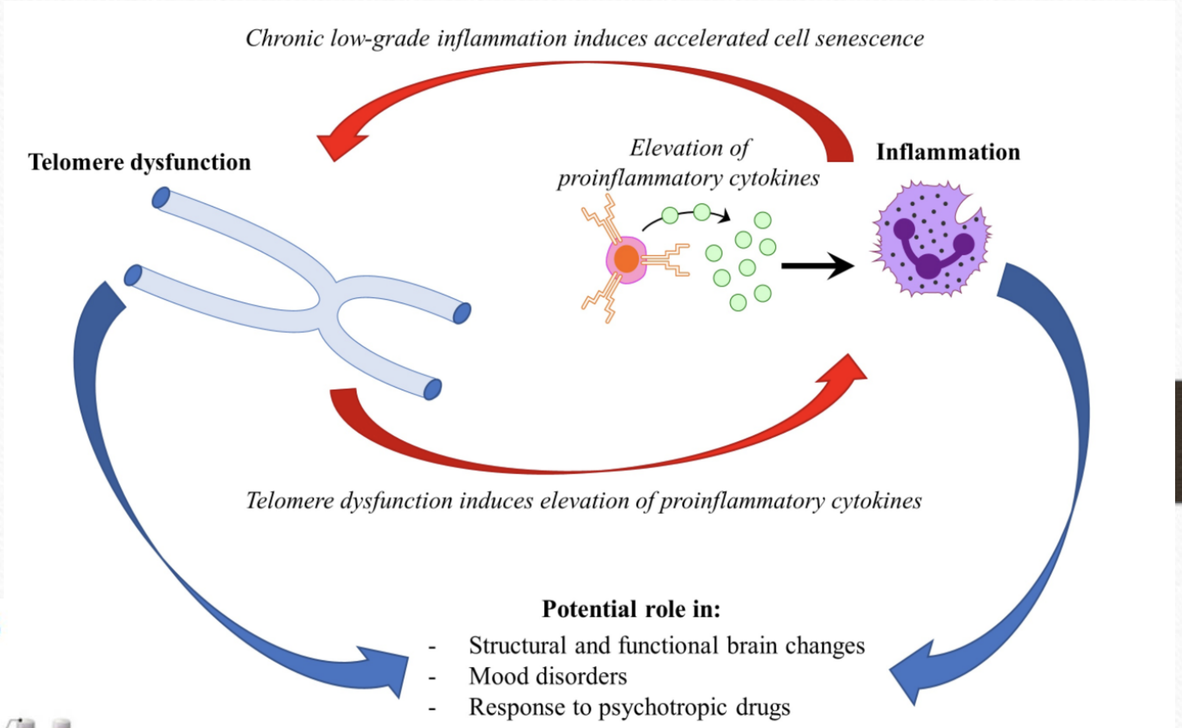
In people who are 80 or older

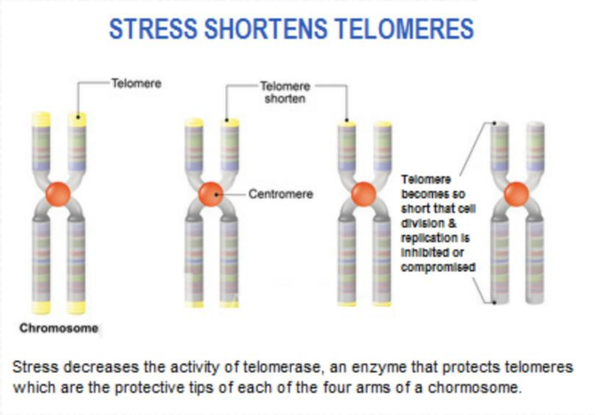
80% of their longevity is due to modifiable risk factors

20% is based on genes

Chronic disease shortens telomeres

Stress shortens telomeres

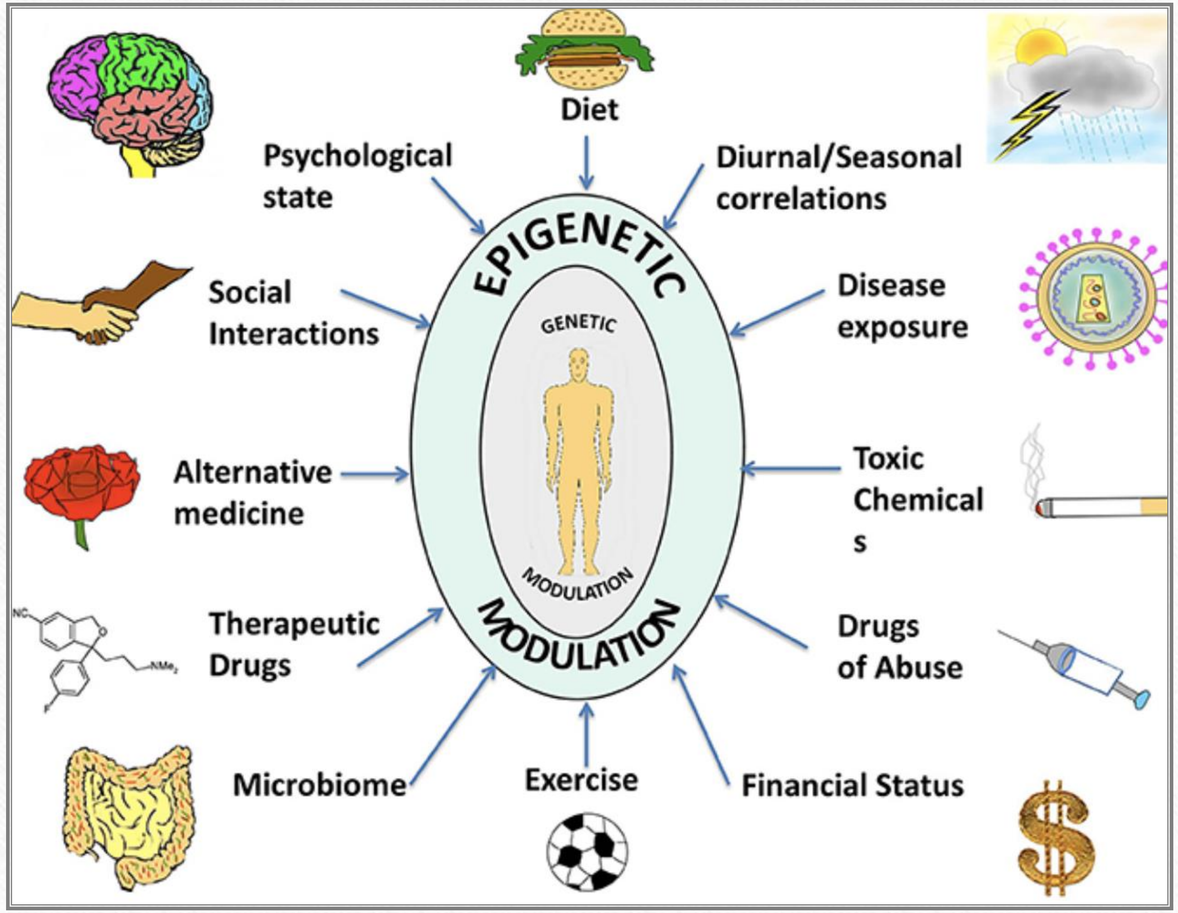


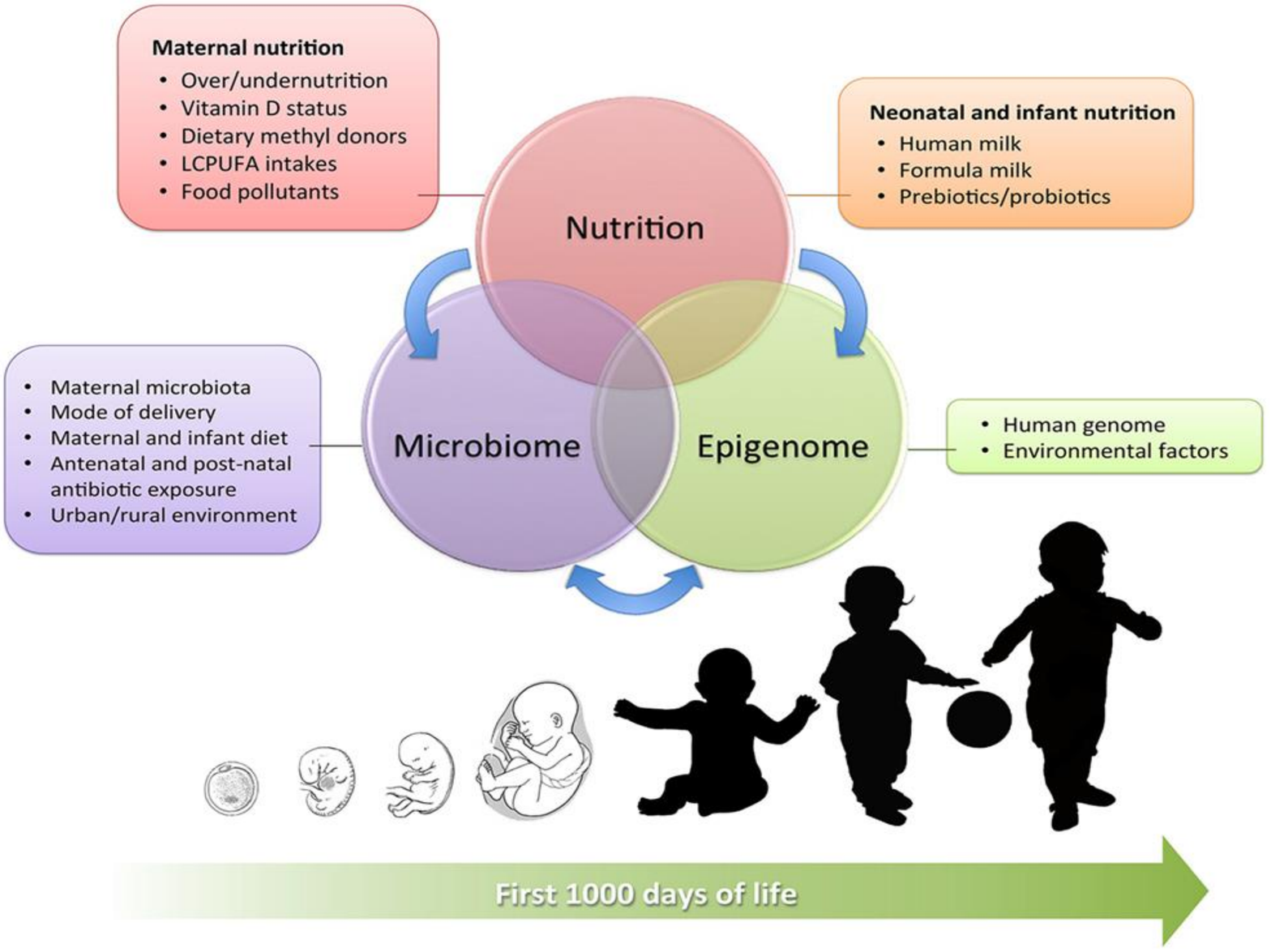


Telomeresand Human disease: Blasco;

Nat Rev Genetics 2005

Epigenetic Modulators




Maternal nutrition
• Over/undernutrition
• Vitamin D status
• Dietary methyl donors
• LCPUFA intakes
• Food pollutants
Neonatal and infant nutrition
• Human milk
• Formula milk
• Prebiotics/probiotics
Nutrition
Microbiome
Epigenome
• Maternal microbiota
• Mode of delivery
• Maternal and infant diet
• Antenatal and post-natal antibiotic exposure
• Urban/rural environment
• Human genome
• Environmental factors
First 1000 days of life

Physiological Changes with Aging

Cardiovascular System:

- **Decreased Cardiac Output:**
  - Age-related structural and functional changes in the heart reduce its pumping efficiency.
  - This can lead to diminished blood flow to vital organs and tissues.
- **Increased Blood Pressure:**
  - Arterial walls lose elasticity with age, contributing to higher systolic blood pressure.
  - This condition, known as arteriosclerosis, increases the risk of cardiovascular events.

Musculoskeletal System:

- **Joint Degeneration:**
  - Cartilage deterioration in joints leads to conditions such as osteoarthritis.
  - This results in pain, stiffness, and reduced mobility.
- **Muscle Mass Decline:**
  - Sarcopenia, the age-related loss of muscle mass and strength, impairs physical function.
  - Contributing factors include hormonal changes, decreased physical activity, and altered protein metabolism.

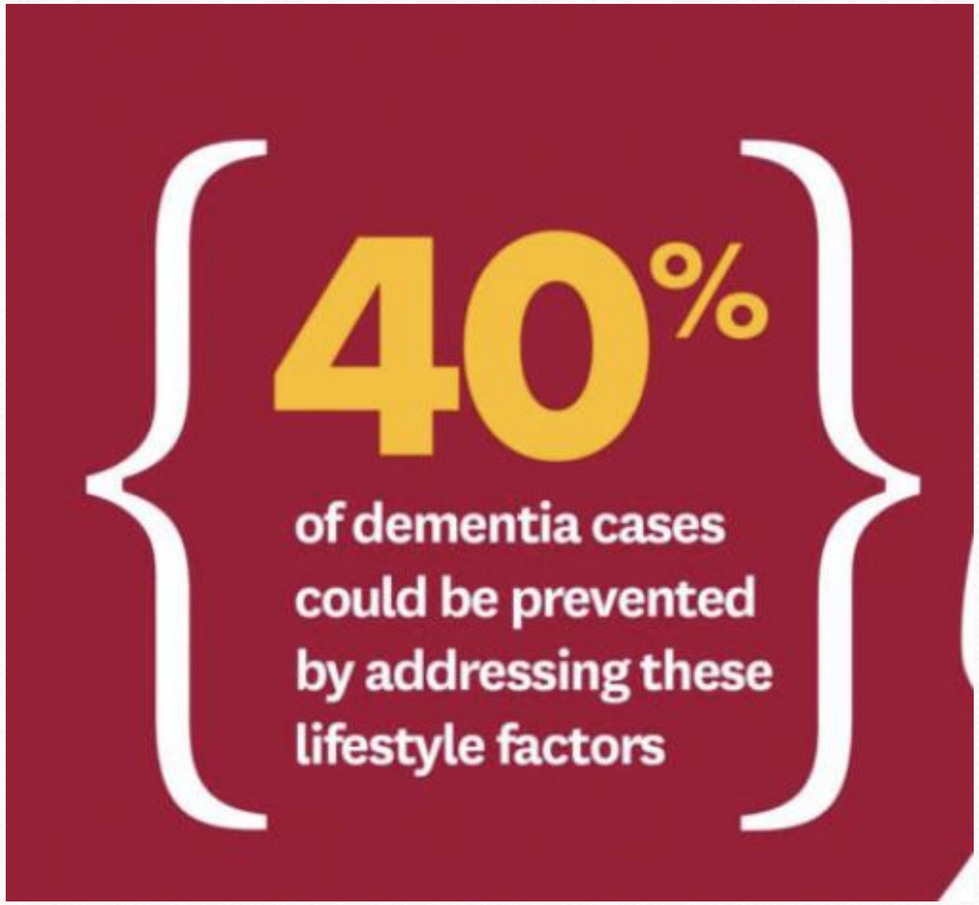
Pathological Changes Associated with Aging

Increased Disease Susceptibility:

- **Neurodegenerative Disorders:**
  - Aging is a major risk factor for diseases like Alzheimer's and Parkinson's.
  - Accumulation of misfolded proteins and neuronal loss characterize these conditions.
- **Metabolic Syndromes:**
  - Older adults have a higher prevalence of type 2 diabetes and metabolic syndrome.
  - Factors include insulin resistance, central adiposity, and dyslipidemia.

Cancer:

- **Cellular Senescence and Tumorigenesis:**
  - While senescence acts as a tumor-suppressive mechanism by halting the proliferation of damaged cells, the accumulation of senescent cells can create a pro-inflammatory environment.
  - This environment may promote tumor development and progression.
- **Genomic Instability:**
  - Age-related decline in DNA repair mechanisms leads to the accumulation of genetic mutations.
  - This genomic instability increases the risk of malignant transformations


40%
of dementia cases could be prevented by addressing these lifestyle factors


INCREASE
Education
Physical Activity
Social Contact
DECREASE
Hearing Loss
Hypertension
Obesity
Smoking
Depression
Diabetes
Excessive Alcohol Intake
Head Injury
Air Pollution

Per NIH

Psychological Changes in Aging

Cognitive Decline:

- **Memory Impairment:**
  - Aging affects various types of memory, including episodic and working memory.
  - Structural brain changes, such as hippocampal atrophy, contribute to these deficits.
- **Reduced Processing Speed:**
  - Older adults often experience slower cognitive processing and reaction times.
  - This can impact daily activities and the ability to learn new information.

Emotional Changes:

- **Increased Risk of Depression:**
  - Factors such as chronic health conditions, social isolation, and bereavement contribute to higher depression rates in the elderly.
  - Depression in older adults is often underdiagnosed and can significantly affect quality of life.
- **Adaptation and Resilience:**
  - Despite challenges, many older individuals develop resilience through life experience.
  - Engagement in social activities and maintenance of a sense of purpose are crucial for psychological well-being.

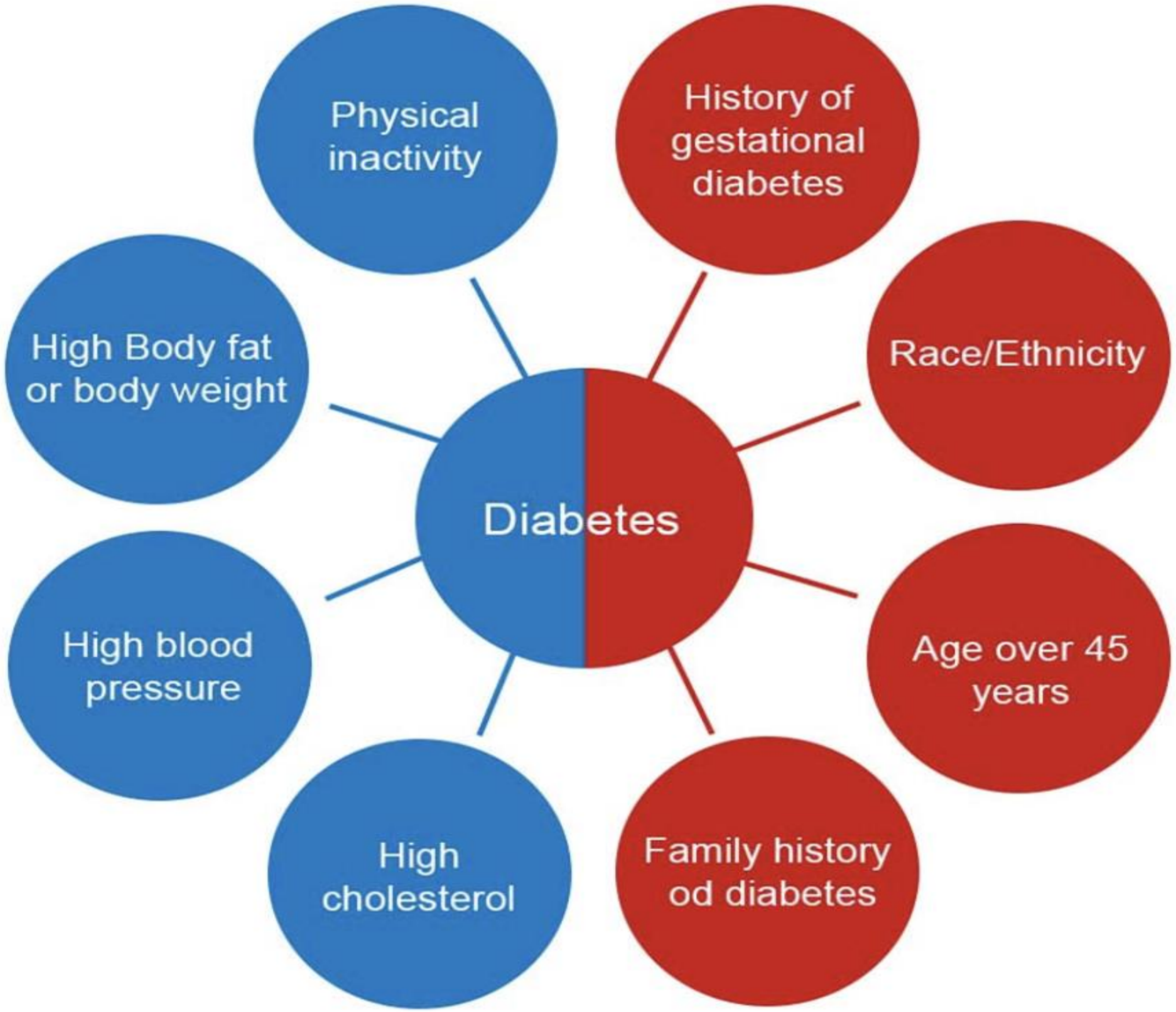
Age

Genetics

Non Modifiable Factors

Ethnicity

Sex


Physical inactivity
History of gestational diabetes
High Body fat or body weight
Race/Ethnicity
Diabetes
High blood pressure
Age over 45 years
High cholesterol
Family history od diabetes

MedCrave
Step into the World of Research

Journal of Nutritional Health & Food Engineering

Opinion

Open Access

CrossMark

Genetics loads the gun, lifestyle pulls the trigger

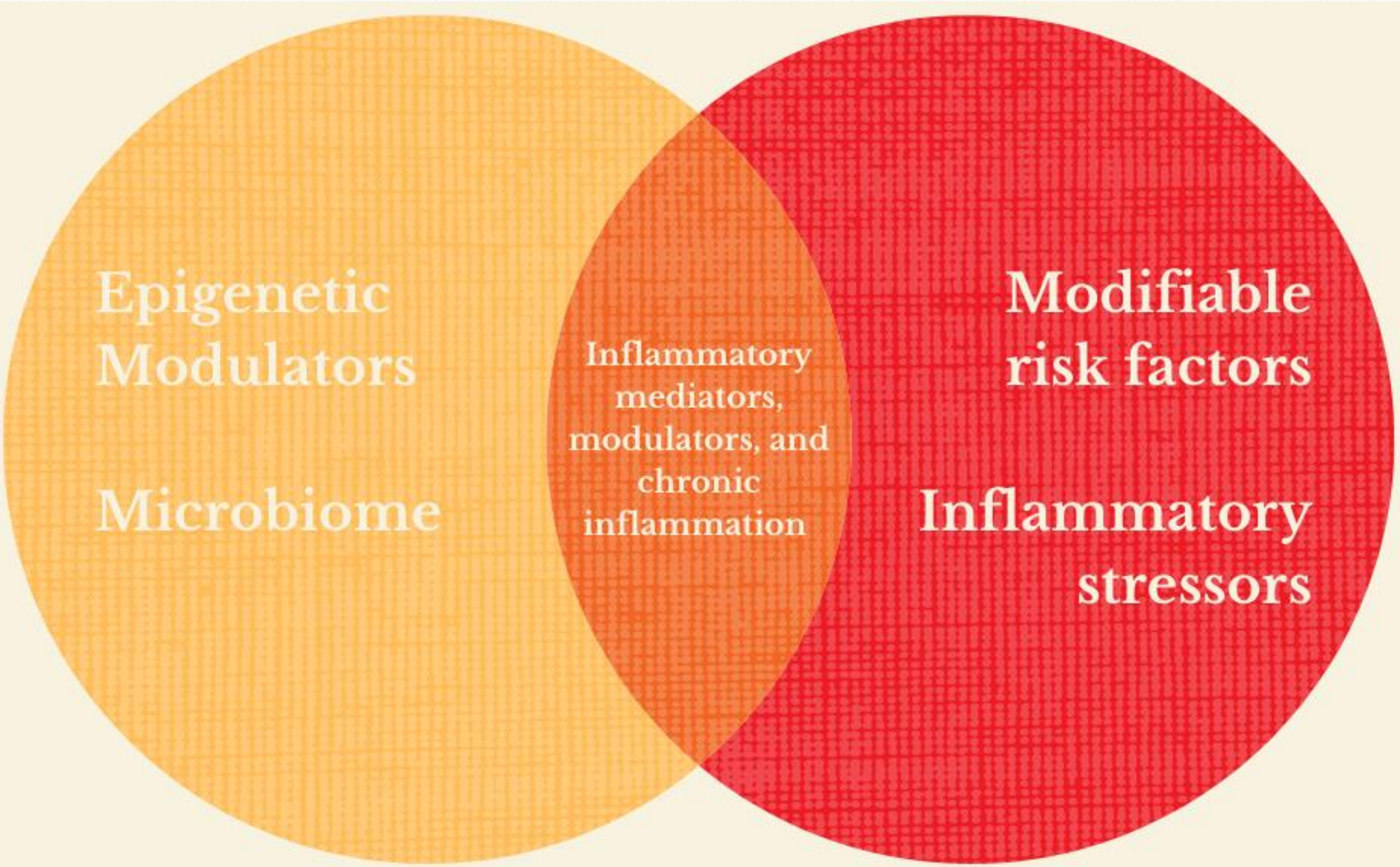
Volume 3 Issue 2 - 2015

Opinion

I just finished watching a presentation by Barbara O'Neill called The True Cause of Diseases. Pretty amazing presentation but one of her statements, amongst many, really grabbed my attention: "Genetics Loads the Gun, Lifestyle Pulls the Trigger". What a profound statement, just THINK about it's implications!

Most people think that Lifestyle means the lives of the rich and famous and never think about how they live their lives. That is lifestyle, how you choose to live your life on a daily basis. What you do, what you eat, how you interact with others; that is Lifestyle. It is the force, an energy that defines all living things, that surrounds and penetrates living beings and is structured by the genetic code and fueled/directed by what you eat. Lifestyle is focused by how you act, how you interact with your environment and how active you are.

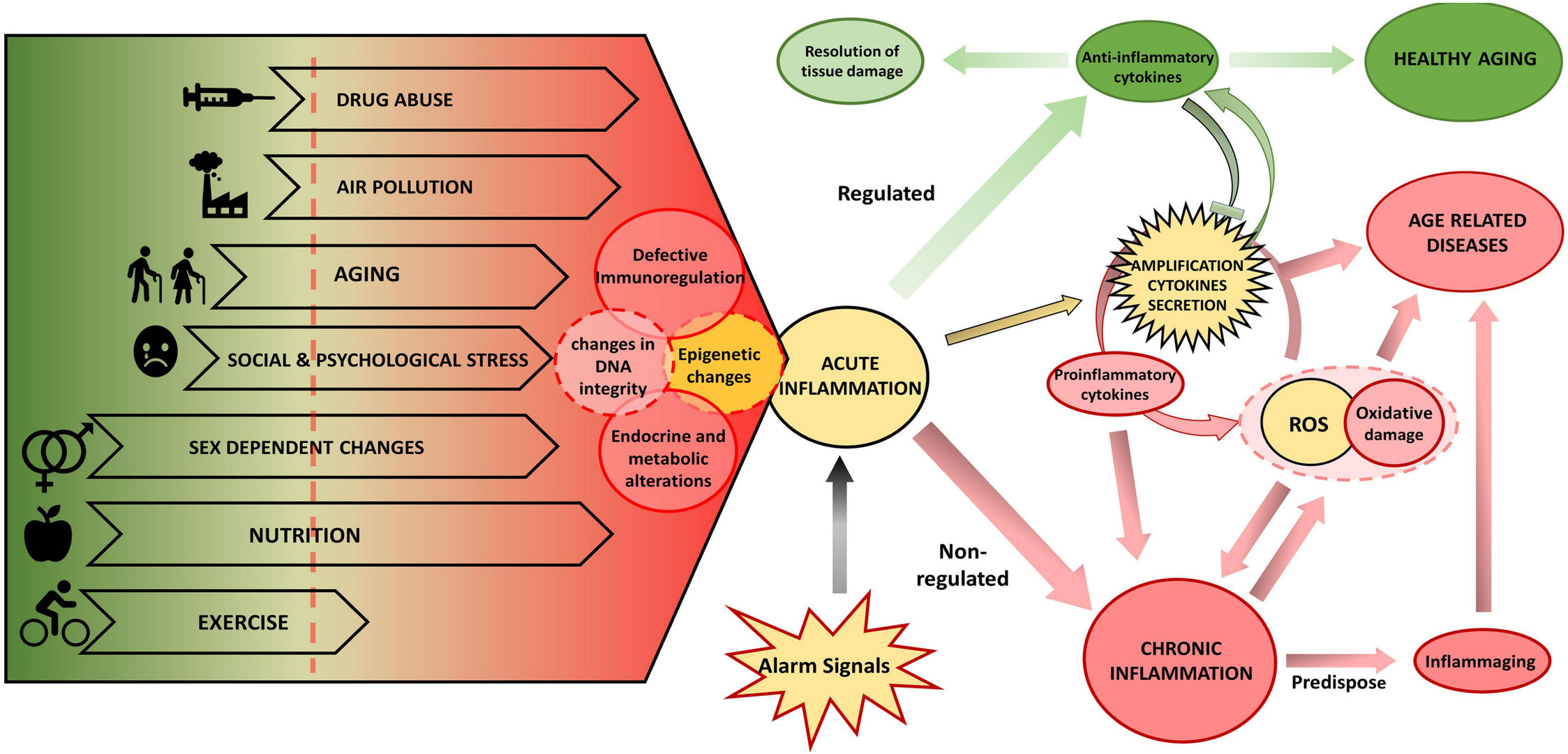
Genes are not always destiny. For multi-genetic diseases like AMD, lifestyle can modulate gene expression. Hence the science of Epigenetics.


Epigenetic Modulators
Microbiome
Inflammatory mediators, modulators, and chronic inflammation
Modifiable risk factors
Inflammatory stressors

Inflammaging

- According to geroscience, inflammation is one of the seven evolutionarily conserved mechanistic pillars of aging that are shared by age-related diseases, including ocular diseases.
- Inflammaging is the long-term result of the chronic physiological stimulation of the innate immune system, which can become damaging during aging — a period of life largely unpredicted by evolution.
- Inflammaging is the by-product of the degeneracy of a few receptors that can sense a variety of non-self, self and quasi-self damage signals (or 'garbage') and activate the innate immune system.
- The gut microbiota has a central role in metaflammation and inflammaging, as it can release inflammatory products and contribute to the circadian rhythms and crosstalk with other organs and systems.

Franceschi, C., Garagnani, P., Parini, P. *et al.* Inflammaging: a new immune–metabolic viewpoint for age-related diseases. *Nat Rev Endocrinol* 14, 576–590 (2018).


DRUG ABUSE
AIR POLLUTION
AGING
SOCIAL & PSYCHOLOGICAL STRESS
SEX DEPENDENT CHANGES
NUTRITION
EXERCISE
Defective Immunoregulation
changes in DNA integrity
Epigenetic changes
Endocrine and metabolic alterations
ACUTE INFLAMMATION
Resolution of tissue damage
Anti-inflammatory cytokines
HEALTHY AGING
Regulated
AMPLIFICATION CYTOKINES SECRETION
AGE RELATED DISEASES
Proinflammatory cytokines
ROS
Oxidative damage
Non-regulated
Alarm Signals
CHRONIC INFLAMMATION
Predispose
Inflammaging

- PUBLIC HEALTH DEFINED BY WINSLOW IN 1920 AT YALE WAS DEFINED AS THE ART OF PREVENTING DISEASES (NOT JUST CURING THEM) THROUGH LIFESTYLE, FOOD, HYGIENE, AND ENVIRONMENTAL HEALTH…

The New York Times

Opinion

Our Food Is Killing Too Many of Us

Improving American nutrition would make the biggest impact on our health care.

By Dariush Mozaffarian and Dan Glickman

Mr. Mozaffarian is dean of the Tufts Friedman School of Nutrition Science and Policy. Mr. Glickman was the secretary of agriculture from 1995 to 2001.

Aug. 26, 2019

"Poor diet is the *leading cause* of mortality in the United States, causing more than half a million deaths per year."

Original Investigation

FREE

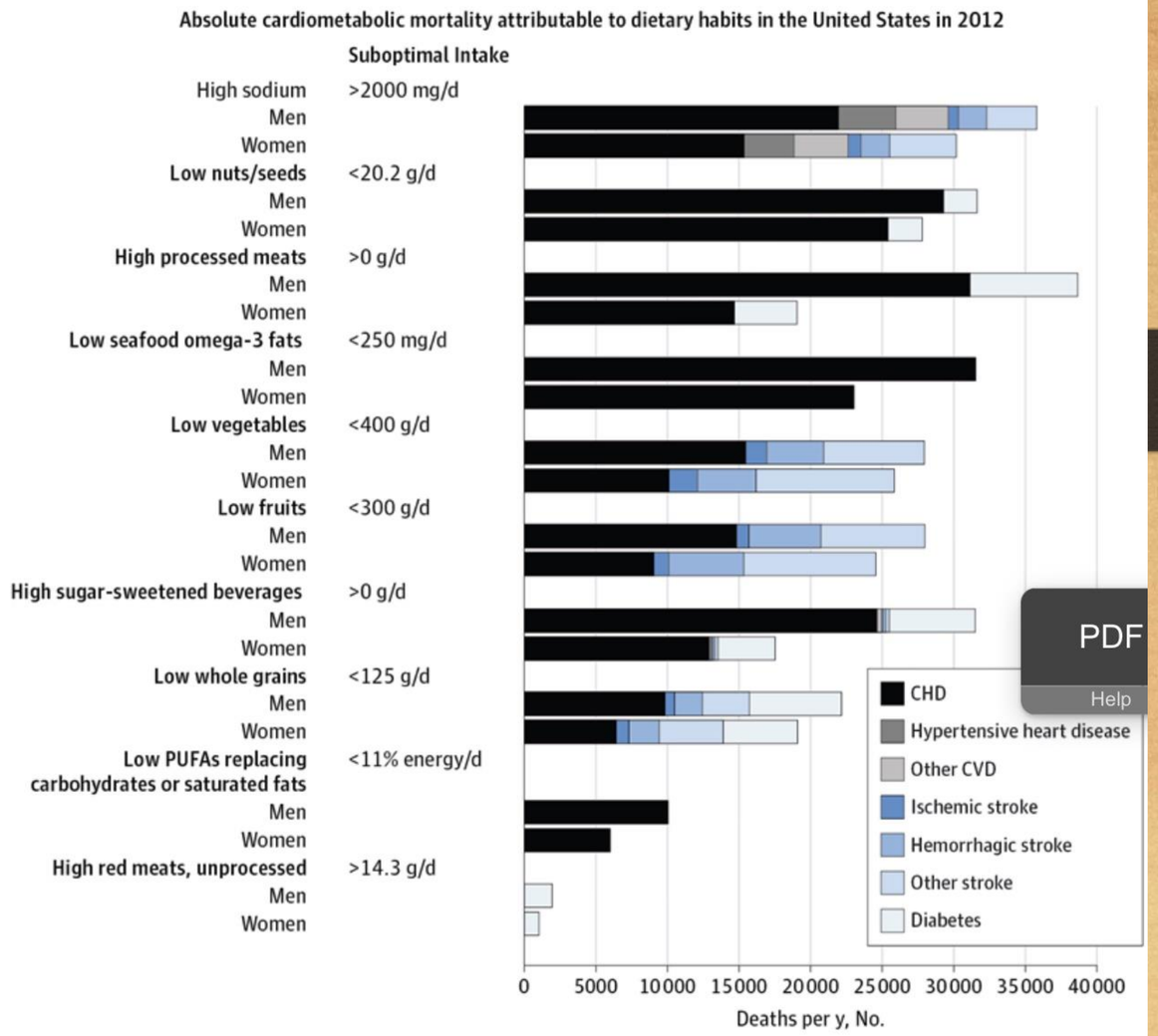
March 7, 2017

Association Between Dietary Factors and Mortality From Heart Disease, Stroke, and Type 2 Diabetes in the United States

Renata Micha, RD, PhD[1]; Jose L. Peñalvo, PhD[1]; Frederick Cudhea, PhD[1]; et al

» Author Affiliations | Article Information

Figure 1. Absolute and Proportional Cardiometabolic Disease Mortality Associated With Suboptimal Dietary Habits Among US Men and Women in 2012



Contents lists available at ScienceDirect

Clinical Nutrition

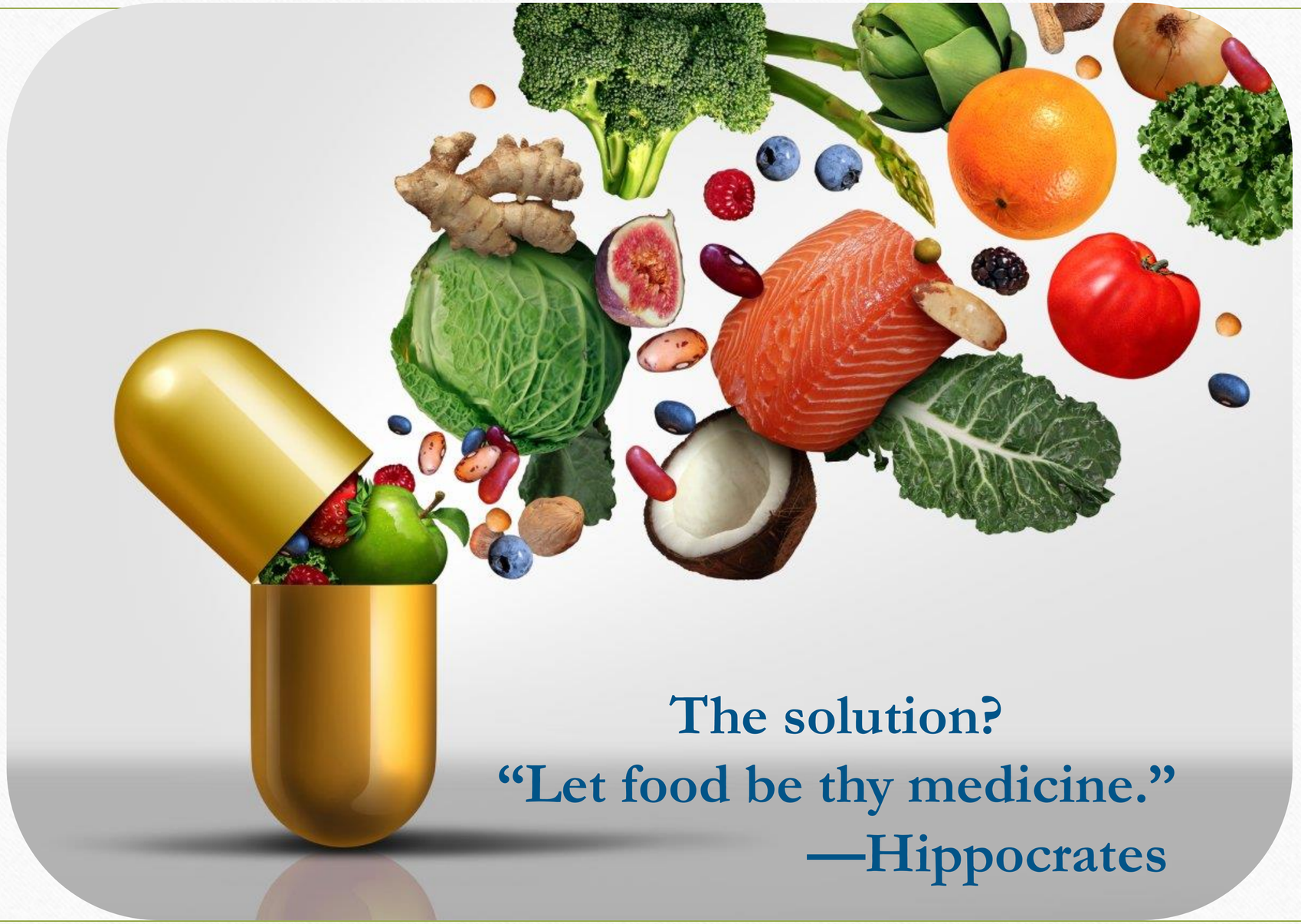
journal homepage: http://www.elsevier.com/locate/clnu

Original article

The inflammatory potential of diet is associated with the risk of age-related eye diseases

Joëlle E. Vergroesen [a, b], Eric F. Thee [a, b, c], Tosca O.E. de Crom [b], Jessica C. Kiefte-de Jong [d], Magda A. Meester-Smoor [a, b], Trudy Voortman [b, e], Caroline C.W. Klaver [a, b, c, f, g], Wishal D. Ramdas [a, *]

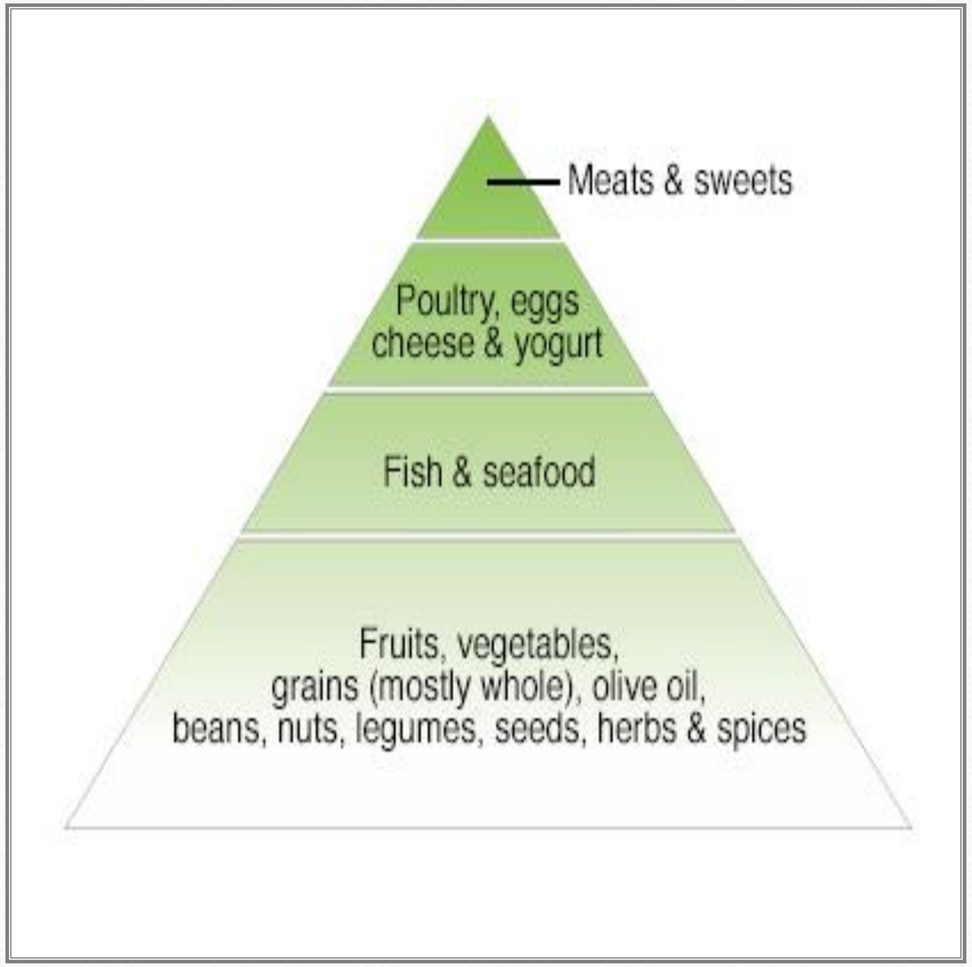
Conclusions: A pro-inflammatory diet was associated with increased risks of cataract and AMD. Particularly the NLR, a marker of subclinical inflammation, appears to be implicated. These findings are relevant for patients with AMD and substantiate the current recommendations to strive for a healthy lifestyle to prevent blindness.


The solution?
“Let food be thy medicine.”
—Hippocrates

Today we know that Mediterranean diet offers good health and longevity.

Mediterranean diet

- It is rich in vitamins
- Reduces the risk of heart disease
- Reduces incidence of cancer, and Parkinson's and Alzheimer's diseases
- **Reduces risk of macular degeneration and cataracts**



Mediterranean diet's pyramid

Nutrients Act Synergistically

K.I.S.S. Principal for Healthy Eating for Eye Health:

Eat the rainbow, much of your plate should be colorful fruits and vegetables

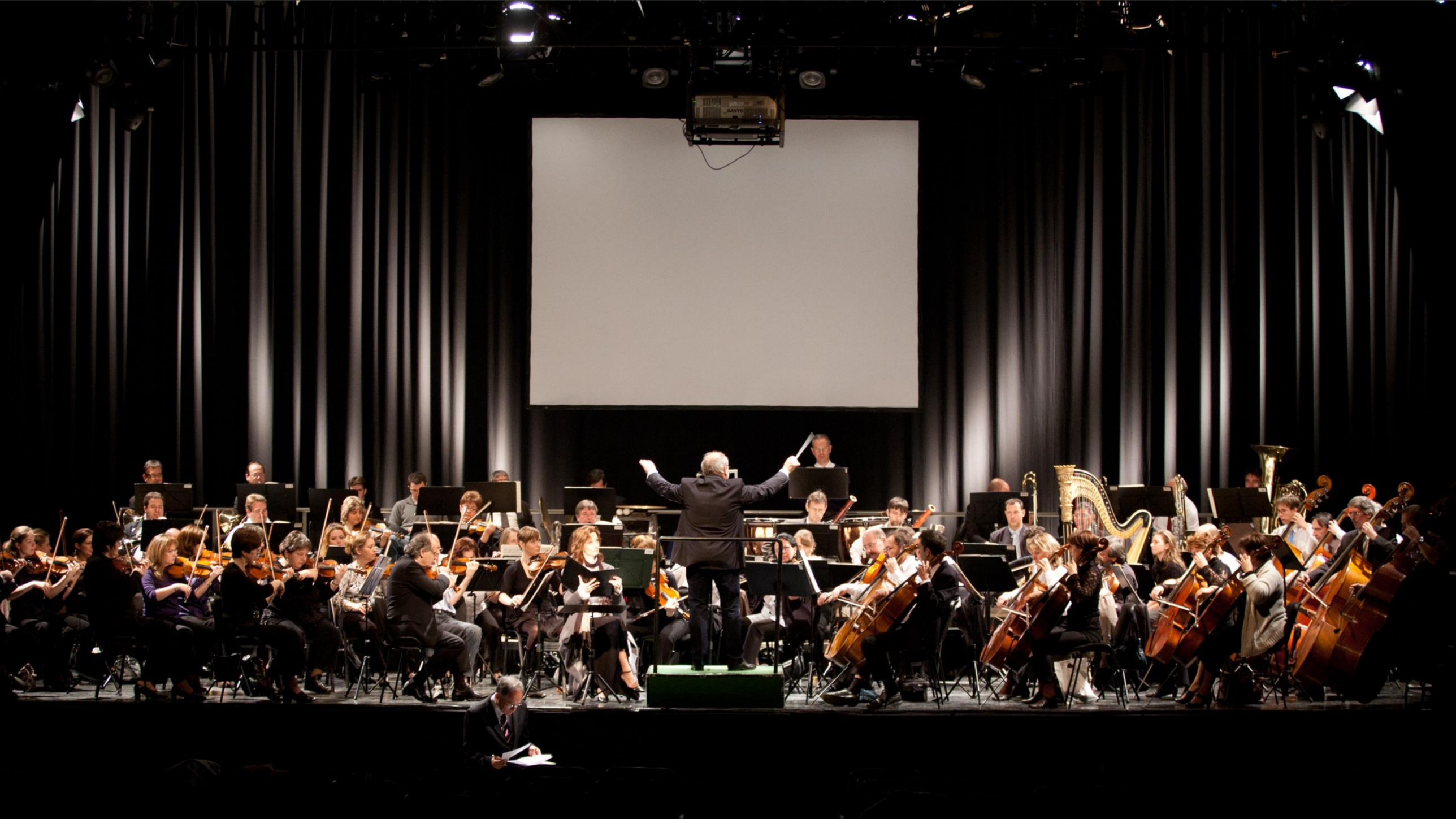
Eat fatty fish (SMASH) at least twice a week

Olive oil and nuts should be mainstays

FOR HEALTH, IT'S NOT JUST ABOUT FOOD, IT'S ABOUT HOW OUR BODY **RESPONDS** TO WHAT WE FEED IT

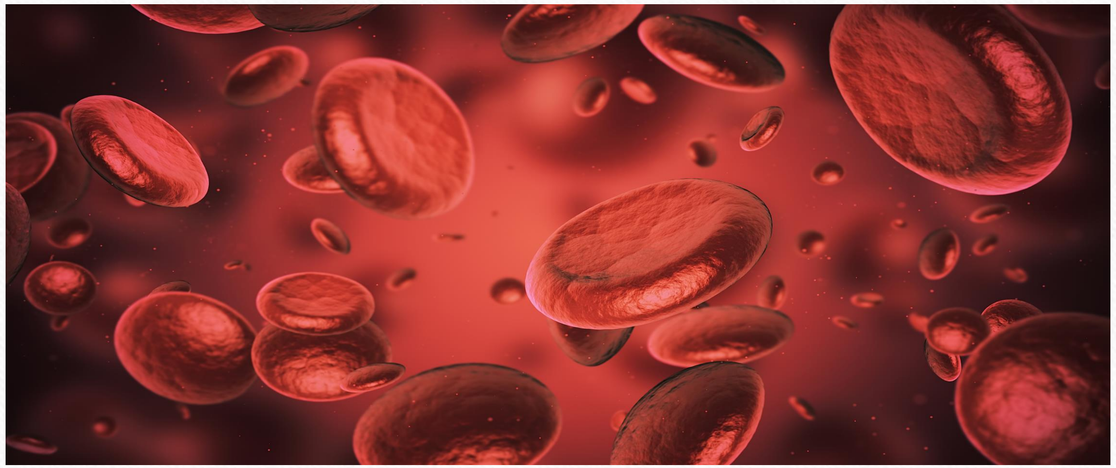
Systems of defense against disease:

Angiogenesis, regeneration, microbiome, DNA protection, Immunity



Angiogenesis

- the growth of blood vessels from the existing vasculature. It occurs throughout life in both health and disease, beginning in utero and continuing on through old age.



EXCESSIVE

- Cancer *
- Blinding diseases *
- Pulmonary fibrosis *
- Psoriasis
- Arthritis
- Endometriosis
- Alzheimers Disease
- Obesity
- Multiple sclerosis
- Cerebral malaria
- Rosacea

ANGIOGENESIS DEFENSE (Microcirculation)

HEALTHY

INSUFFICIENT

- * Chronic wounds
- Coronary Heart Disease
- * Peripheral Arterial Disease
- Stroke
- Neuropathies
- Pre-eclampsia
- Hair loss
- Erectile dysfunction

Foods with Antiangiogenic Activity

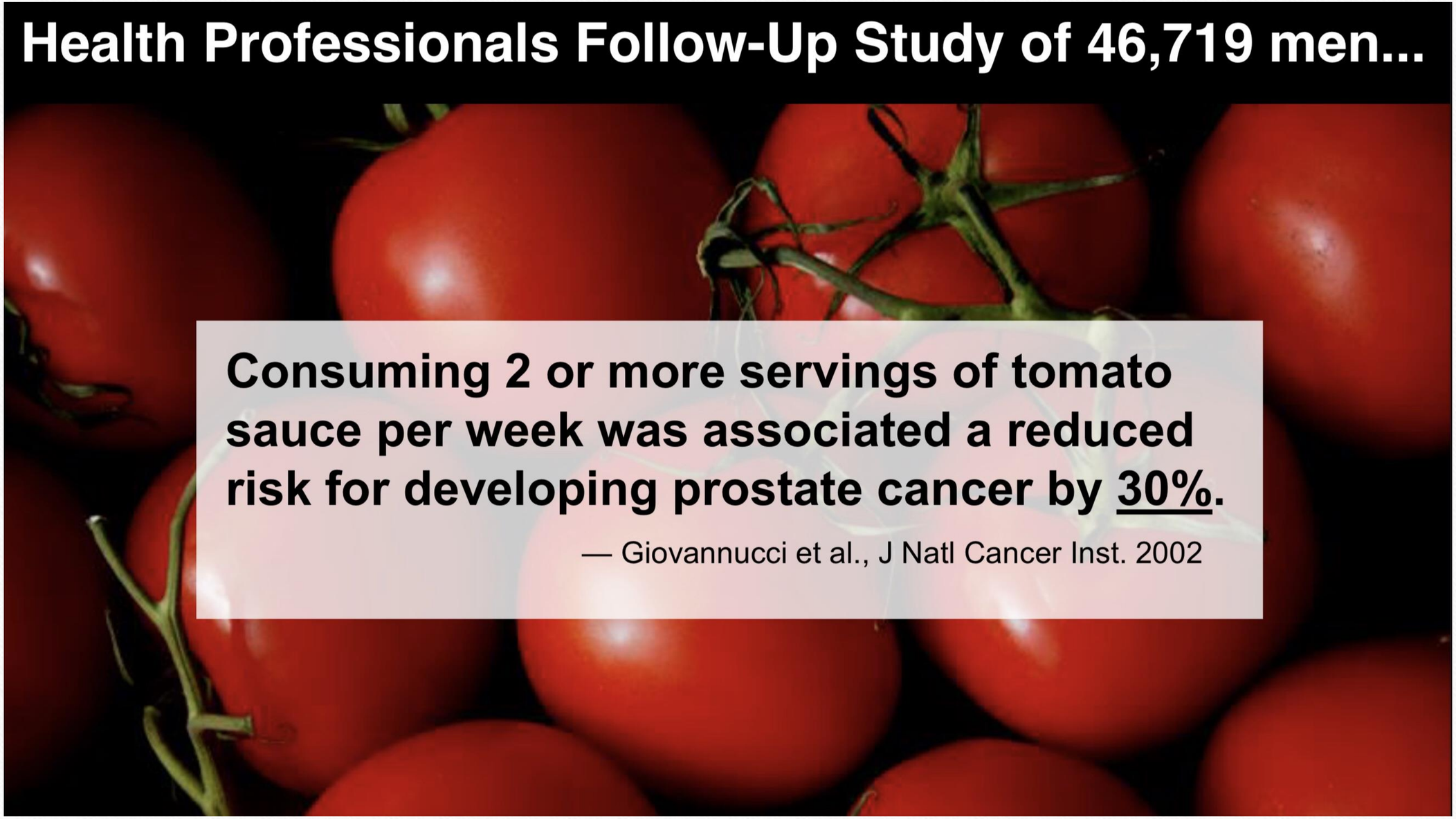
Tomato
Strawberries
Blackberries
Raspberries
Blueberries
Oranges
Grapefruit
Lemons
Apples
Pomegranate
Cherries

Red grapes
Red wine
Bok choy
Cavolo nero kale
Soy beans
Ginseng
Maitake mushroom
Licorice
Turmeric
Nutmeg
Chestnut

Lavender
Pumpkin
Lychee
Parsley
Garlic
Green tea
Dark chocolate
Tree nuts

— Li W, EAT TO BEAT DISEASE (2019) — drwilliamli.com

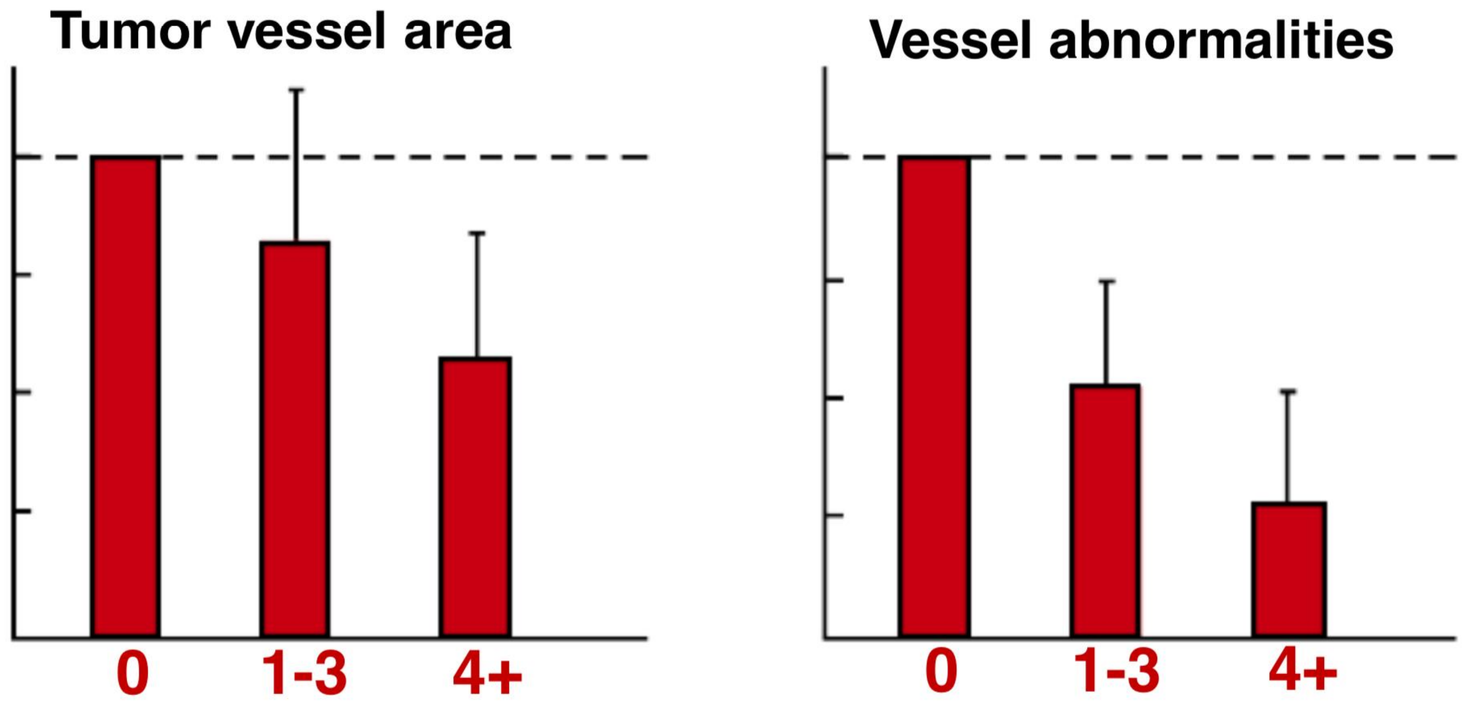
Health Professionals Follow-Up Study of 46,719 men...



Consuming 2 or more servings of tomato sauce per week was associated a reduced risk for developing prostate cancer by 30%.

— Giovannucci et al., J Natl Cancer Inst. 2002

Even in those did develop prostate cancer, the biopsy showed *reduction* of tumor vessels with more tomato consumption



— Courtesy L Mucci

EXCESSIVE

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ANGIOGENESIS DEFENSE

HEALTHY

INSUFFICIENT

- * Chronic wounds
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- * Peripheral Arterial Disease
- Stroke
- Neuropathies
- Pre-eclampsia
- Hair loss
- Erectile dysfunction

William W. LI MD, Angiogenesis foundation

Foods with Angiogenesis-Stimulating Activity

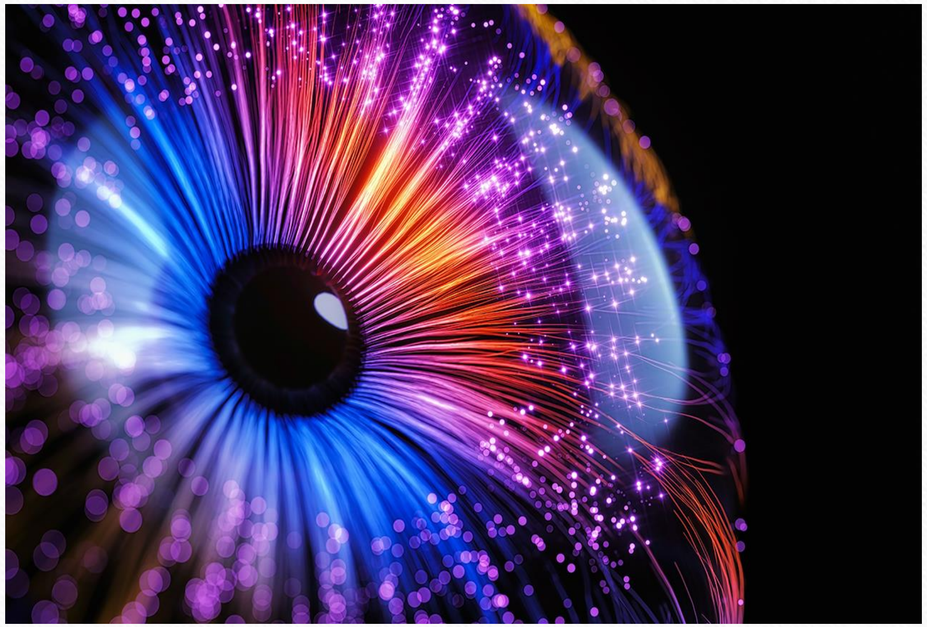
- Apple peel
- Dried cranberry
- Dried cherries
- Dried blueberries
- Barley
- Chili peppers
- Ginseng
- Onions
- Peppermint
- Pumpkin seeds
- Red leaf lettuce
- Rosemary
- Sesame seeds
- Sultana raisins
- Sunflower seeds

— Li W, EAT TO BEAT DISEASE (2019) — drwilliamli.com

Remarkably, our health defense systems titrate the effect of beneficial dietary factors so that the system will only achieve homeostasis, but not overshoot to cause disease.

Regeneration

- **Humans do regenerate (stem cells)**
- Small intestine regenerates every 2 to 4 days
- Lungs and stomach regenerate every 8 days
- Skin regenerates every 14 days
- Red blood cells every 4 months
- Fat cells every 8 years
- Skeleton every 10 years



Cell Stem Cell

Volume 28, Issue 7, 1 July 2021, Pages 1248-1261.e8

Article

Discrete limbal epithelial stem cell populations mediate corneal homeostasis and wound healing

Anna Altshuler [1, 5], Aya Amitai-Lange [1, 5], Noam Tarazi [1], Sunanda Dey [1], Lior Strinkovsky [2], Shira Hadad-Porat [1], Swarnabh Bhattacharya [1], Waseem Nasser [1], Jusuf Imeri [1], Gil Ben-David [1], Ghada Abboud-Jarrous [4], Beatrice Tiosano [3], Eran Berkowitz [3], Nathan Karin [4], Yonatan Savir [2, 6] ✉, Ruby Shalom-Feuerstein [1, 6, 7] ✉

Cells of the corneal epithelium are renewed approximately every 10 days

50%

of human adult stem cell activity is lost during aging

J Am Coll Cardiol 2005;45:1441.

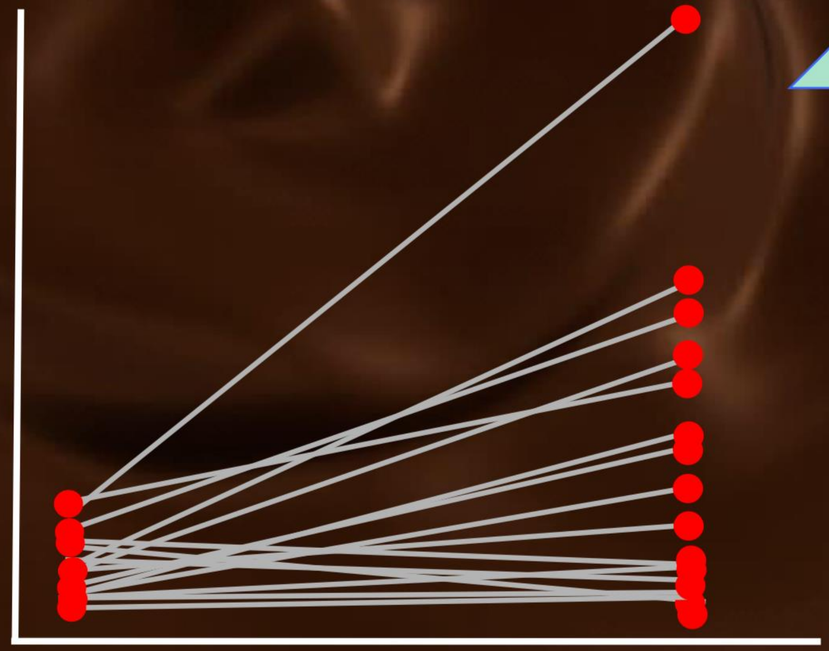
Conditions Where Stem Cells Are Important

Alopecia
Alzheimer's disease
Asthma
Atherosclerosis
Autism
Burn injury
Chronic wounds
Diabetes
Erectile dysfunction
Infertility
Ischemic heart disease
Ischemic stroke
Macular degeneration
Neuropathy
Osteoporosis
Parkinson's disease
Peripheral arterial disease
Skin aging

People Drinking Hot Cocoa (High flavanol)

(2 cups/day)

Adult Stem Cells
circulating in bloodstream



Up to 2-Fold

Start **1 month later**

16 subjects

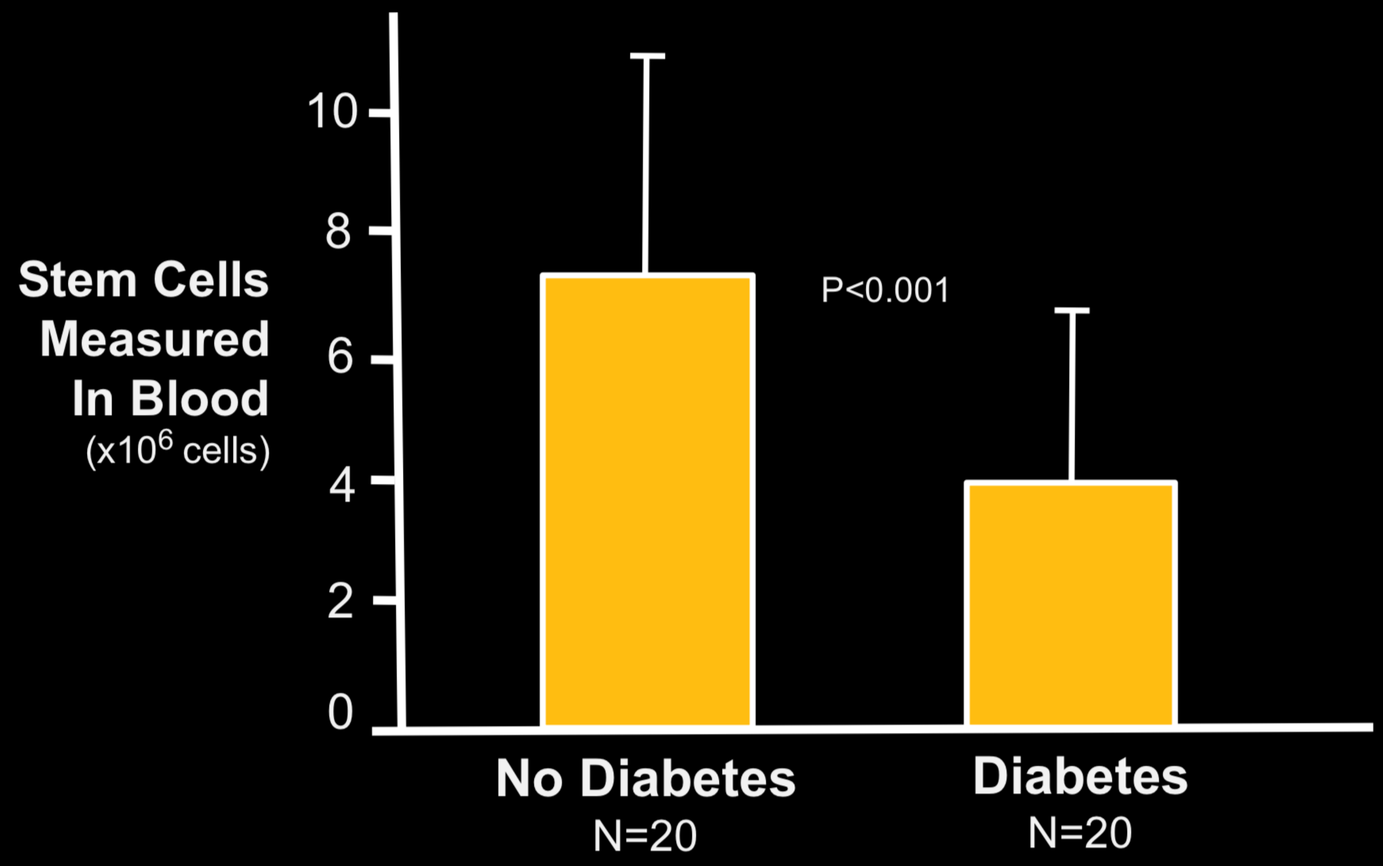
J Am Coll Cardiol 2010;56:218

A study of **20,000 people** showed eating **7.5 gram chocolate** per day **lowered the risk** of heart attack or stroke by

39%

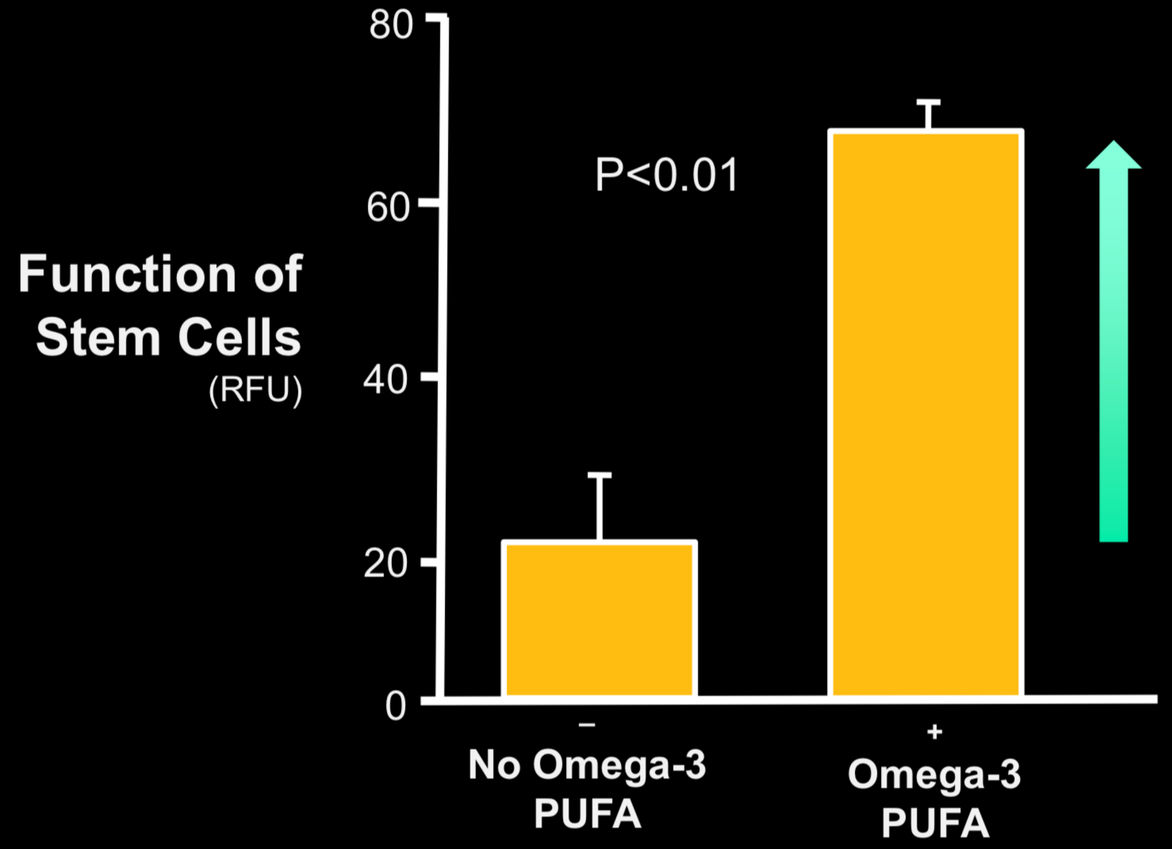
Eur Heart J 2010;31:1616.

Diabetes Impairs Stem Cells in the Body



Diabetes 2004;53:195.

Omega-3 PUFA Stimulate Stem Cells in Diabetes



PLoS One 2013;8:e55177.

Foods that Stimulate Stem Cells

- Bamboo shoots
- Black chokeberry
- Blueberries
- Chinese celery
- Collard greens
- Dark chocolate
- Goji berries
- Green beans
- Green tea
- Mango
- Omega 3 PUFA
- Pistachios
- Plums
- Spinach
- Turmeric

— Li W, EAT TO BEAT DISEASE (2019)

Dietary Pattern that Enhance Stem Cells	Dietary Patterns that *Harm* Stem Cells
MEDITERRANEAN	HIGH FAT
OKINAWAN	HIGH SALT
CALORIC RESTRICTED	HYPERGLYCEMIC
INTERMITTENT FASTING	

JOURNAL ARTICLE

Effect of a Mediterranean diet on endothelial progenitor cells and carotid intima-media thickness in type 2 diabetes: Follow-up of a randomized trial FREE

Maria Ida Maiorino ✉, Giuseppe Bellastella, Michela Petrizzo, Maurizio Gicchino, Mariangela Caputo, Dario Giugliano, Katherine Esposito

European Journal of Preventive Cardiology, Volume 24, Issue 4, 1 March 2017, Pages 399–408, https://doi.org/10.1177/2047487316676133

Published: 29 August 2020 **Article history ▾**

Conclusion

Compared with a low-fat diet, a long-term trial with Mediterranean diet was associated with an increase in circulating EPCs levels and prevention of the progression of subclinical atherosclerosis in patients with newly diagnosed type 2 diabetes.

Foods that Kill Cancer Stem Cells

Science News *from research organizations*

Chance of colon cancer recurrence nearly cut in half in people who eat nuts

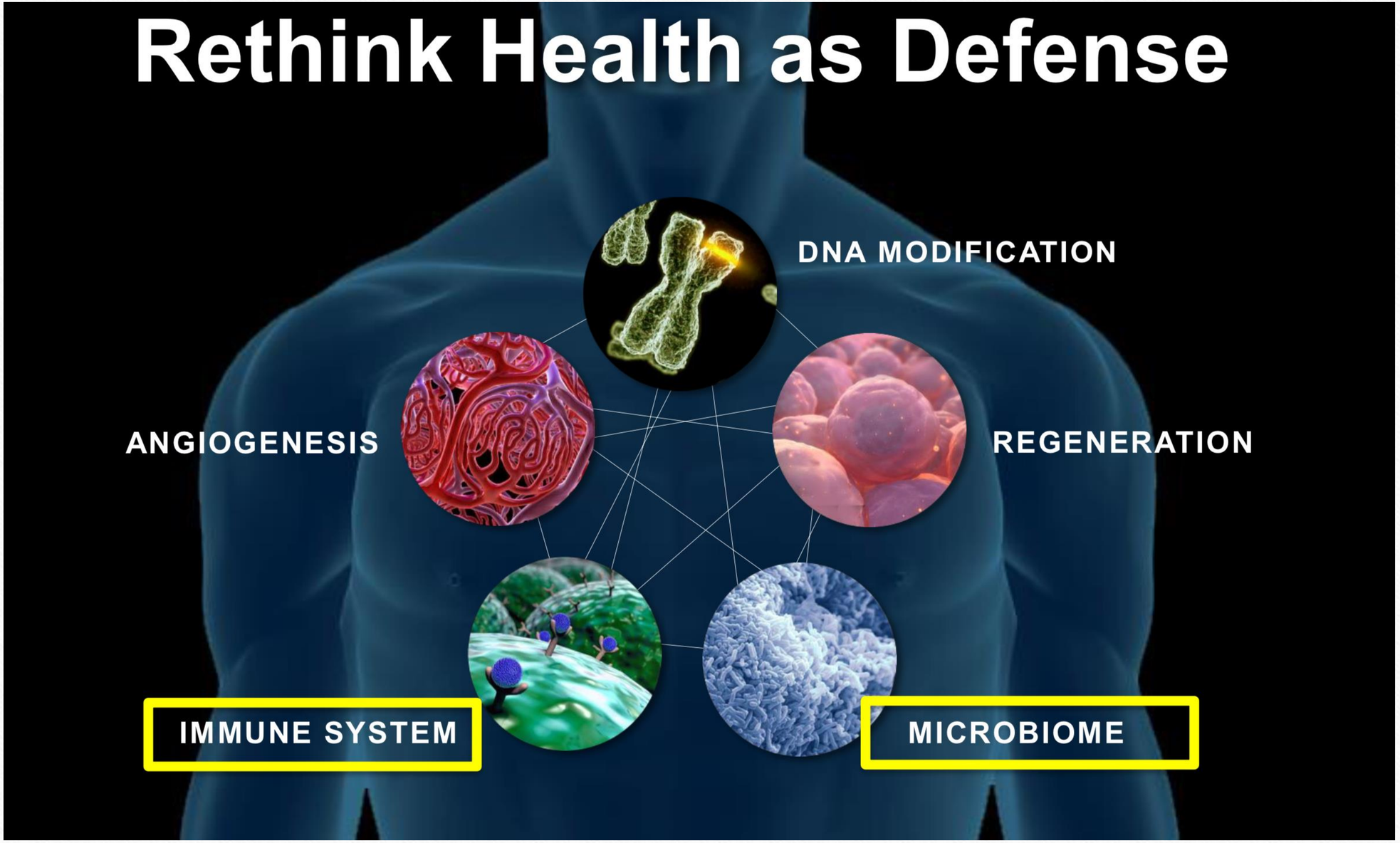
Date: May 18, 2017

Source: American Society of Clinical Oncology (ASCO)

Summary: Something as simple as eating tree nuts may make a difference in the long-term survival of patients with colon cancer, a new study concludes.

An observational study of 826 patients with stage III colon cancer showed that those who consumed two ounces or more of nuts per week had a 42% lower chance of cancer recurrence and 57% lower chance of death than those who did not eat nuts.

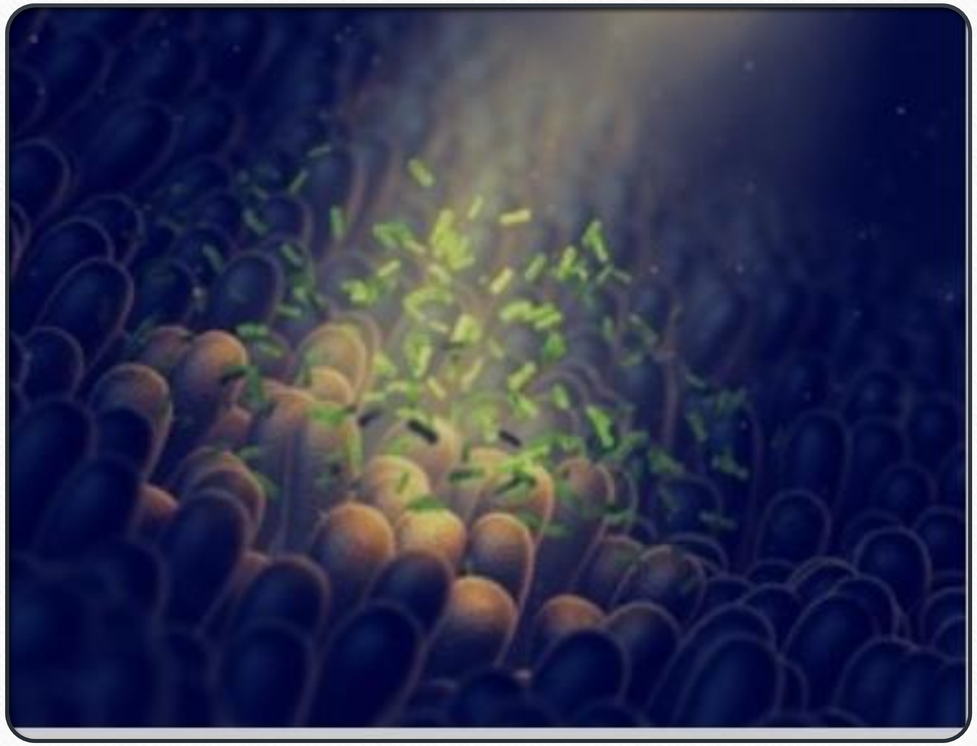
Rethink Health as Defense



William W. LI MD, Angiogenesis foundation

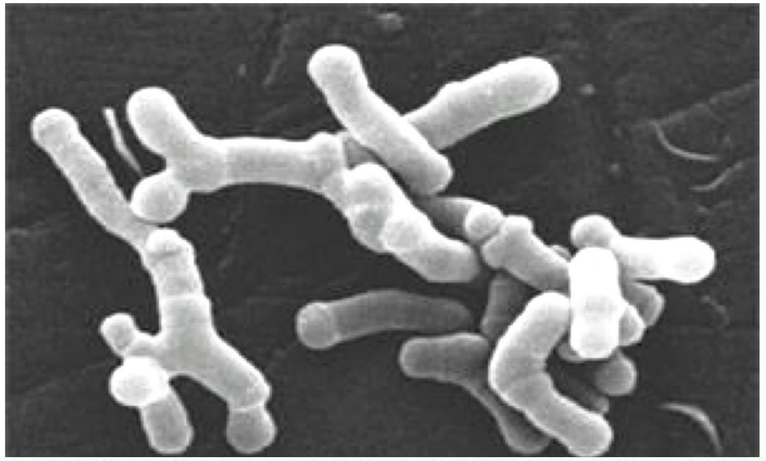
Microbiome

- No longer are we considered simply human…Microbiome research has shown us that we are holobionts….organisms that function as an assemblage of multiple species that are mutually beneficial…
- There are roughly 39 trillion bacteria in our bodies, roughly matching the number of our own 37 trillion cells
- Microbiome diversity is a hallmark of health
- The diversity of the diet dictates the diversity of the microbiome



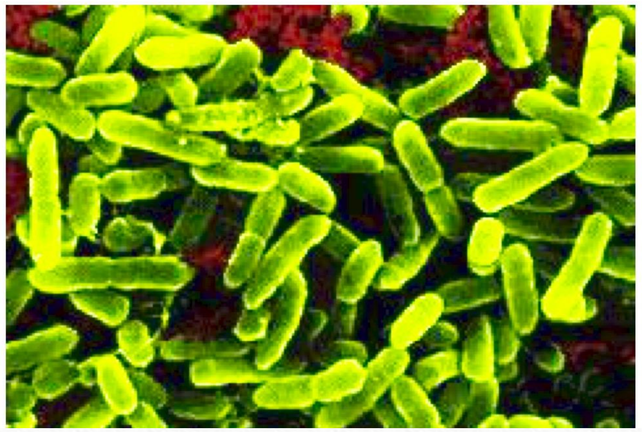
The Human GIT Microflora

- Human GIT microflora contains 10^{14} viable microorganisms
  - this is 10 times the number of cells in the human body!
    - from over 1000 different species
  - a mutually beneficial symbiotic relationship

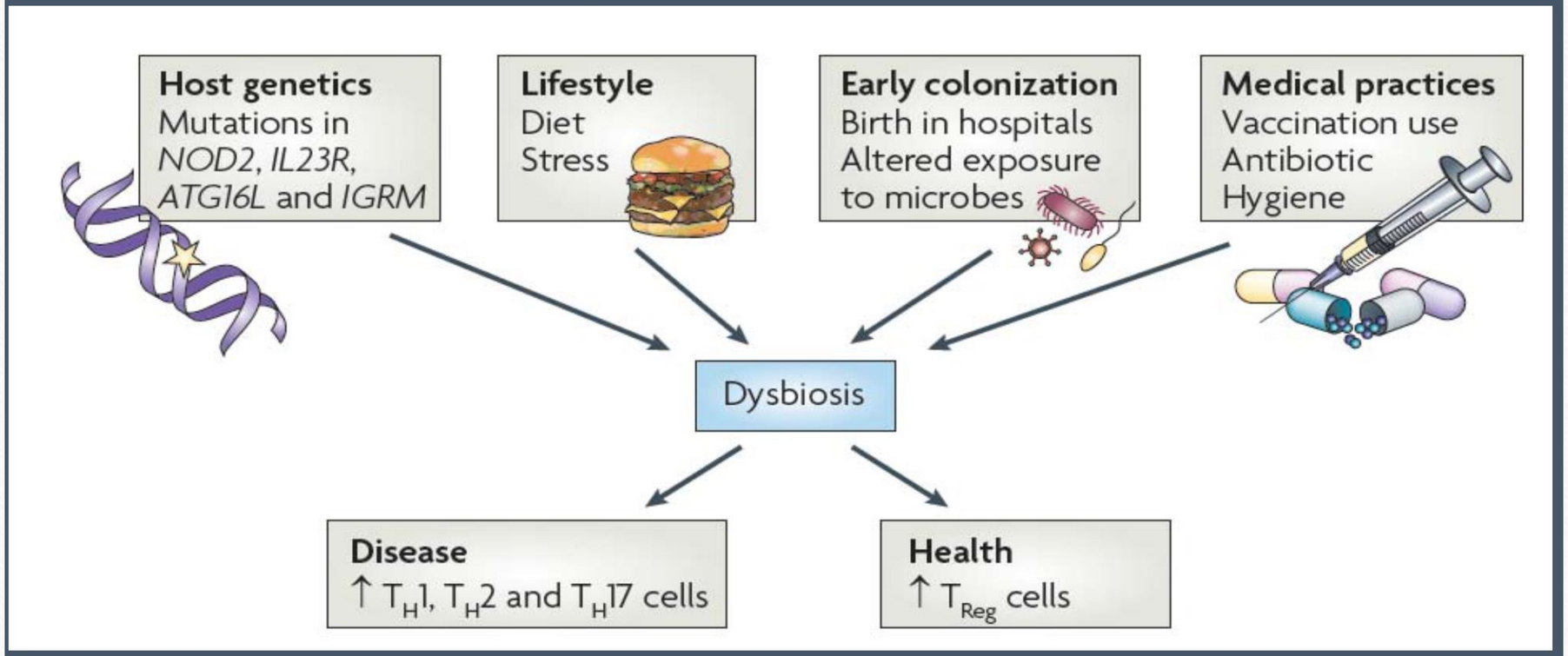


The Human GIT Microbiota

- Can be considered an additional human organ
  - this “microbe” organ weighs 1-1.5 kg
  - rivals the liver in the number of biochemical reactions in which it participates



"…the composition of microbiota can shape a healthy immune response or predispose to disease."



Nature Reviews Immunology Vol 9, May 2009| 313.

The gut microbiome orchestrates human metabolism, immunity, gene expression

"The hundred trillion bacteria in the body of an adult human contain about 4 million distinct bacterial genes, with more than 95% of them located in the large intestine. Since most of these genes encode for enzymes and structural proteins that influence the functioning of mammalian cells, the gut microbiome can be viewed as an anaerobic bioreactor programmed to synthesize molecules which direct the mammalian immune system, modify the mammalian epigenome, and regulate host metabolism"

Galland L. Gut microbiome and brain. *J Med Food* 2014

From the 2019 Congress of Clinical Rheumatology: keynote speaker James T. Rosenbaum, MD, Chief of Ophthalmology at the Legacy Devers Eye Institute in Portland and Chief of Arthritis and Rheumatic diseases at the Oregon Health and Science University spoke on the microbiome and rheumatic disease:

“I submit to you that in any disease that has an immune component — whether it’s Alzheimer’s, Parkinson’s, autism, atherosclerosis, obesity, diabetes and any disease that you are seeing in your clinics with an immune component — the microbiome is having some effect,” Rosenbaum told the attendees, “Whether it’s a small effect or a large effect, it is hard to say, but in these experimental rodents, it’s a huge effect. And one day, we will have therapy that is directed toward repairing or changing, or altering, that microbiome.”

nutrients

MDPI

Nutrients. 2018 Nov; 10(11): 1677.
Published online 2018 Nov 5. doi: 10.3390/nu10111677

PMCID: PMC6267253
PMID: 30400586

The Role of Diet, Micronutrients and the Gut Microbiota in Age-Related Macular Degeneration: New Perspectives from the Gut–Retina Axis

“Low-grade inflammation, sustained by dysbiosis and a leaky gut, has been shown to contribute to the development of AMD”

Abstract

Go to:

Age-related macular degeneration (AMD) is a complex multifactorial disease and the primary cause of legal and irreversible blindness among individuals aged ≥65 years in developed countries. Globally, it affects 30–50 million individuals, with an estimated increase of approximately 200 million by 2020 and approximately 300 million by 2040. Currently, the neovascular form may be able to be treated with the use of anti-VEGF drugs, while no effective treatments are available for the dry form. Many studies, such as the randomized controlled trials (RCTs) Age-Related Eye Disease Study (AREDS) and AREDS 2, have shown a potential role of micronutrient supplementation in lowering the risk of progression of the early stages of AMD. Recently, low-grade inflammation, sustained by dysbiosis and a leaky gut, has been shown to contribute to the development of AMD. Given the ascertained influence of the gut microbiota in systemic low-grade inflammation and its potential modulation by macro- and micro-nutrients, a potential role of diet in AMD has been proposed.

3 Dietary Strategies to Support Microbiome Health Defense

- Prebiotic
- Probiotic
- Avoid dysbiotic foods

KIWIFRUIT - prebiotic

National University of Singapore

- 6 female volunteers
- Fed 2 kiwifruits per day x 4 days
- Check changes in fecal biome

Lactobacillus **increased 35% in 24 hrs**

Bifidobacteria **increased 17% in 4 days**

Beneficial SCFA

Anti-inflammation
Lipid metabolism
Energy metabolism
Gut mucous layer

PAO CAI
KIMCHI
SAURKRAUT

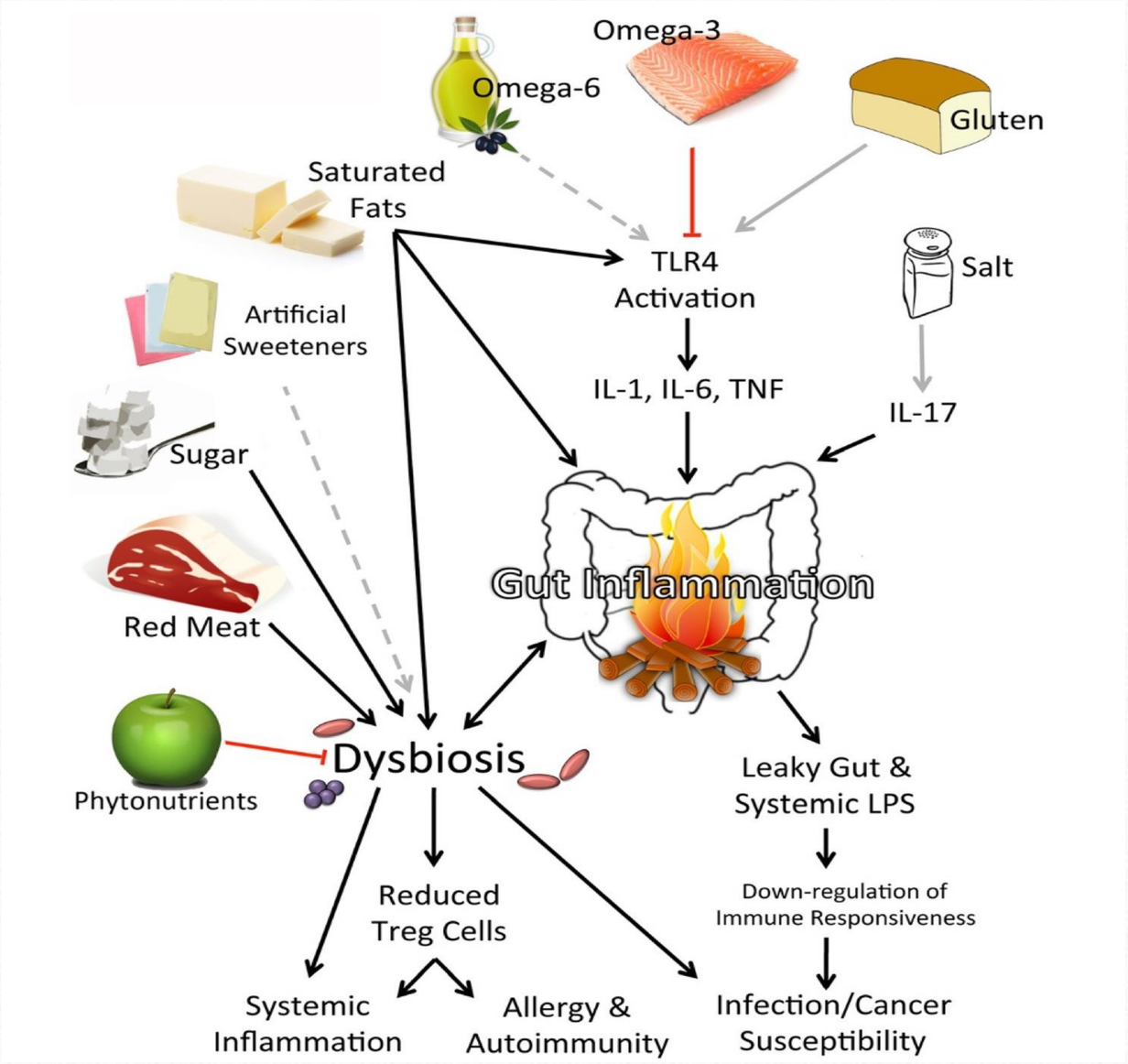
Eat For a Healthy Microbiome

- **Increase consumption of plant foods**
- **Eat fermented foods such as kefir, yogurt, raw sauerkraut, kimchi, fermented vegetables, and kombucha**
- **Eat only unprocessed foods that are low in sugar**
- **Avoid unhealthy fats, sugars, artificial sweeteners, additives and preservatives as they feed an unhealthy microbiome**
- **<u>Microbiome superfoods</u> that contain exactly the kind of fiber that feed many beneficial species: Asparagus, carrots, garlic, Jerusalem artichokes, jicama, leeks, onions, radishes, and tomatoes**

"We don't simply change patients' diet to change their nutrient intake:

We change the diet to change the microbes."

Dr. Alex Vasquez, International College of Human Nutrition and Functional Medicine



Myles Nutrition Journal 2014, 13:61
http://www.nutritionj.com/content/13/1/61

The 3 Most Important Consequences of an Insufficiency of Beneficial Bacteria in the Gut

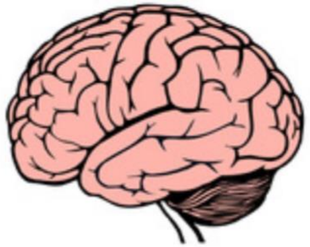
The Very Well Established Synergistic Effects of Probiotic Insufficiency Dysbiosis: ***(A. Vasquez 2014 ICHNFM)***

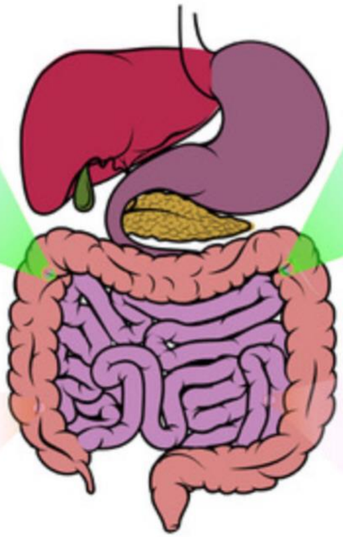
1. ***Lack of immunotolerance and increased systemic inflammation***
2. ***Additional inflammation induced by proinflammatory bacteria and increased absorption of antigens***
3. ***Direct absorption of bacteria, microbial DNA, and pro-inflammatory structures such as LPS***

Vasquez A. Human Microbiome and Dysbiosis in Clinical Disease. 2014 ICHNFM.ORG

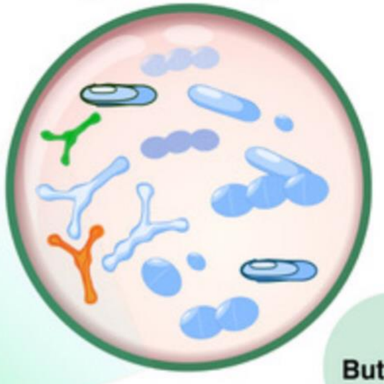
Mediterranean-style diet, rich in varied fresh produce

Diet rich in ultra-processed foods





Eubiosis



- ▲ Neuroplasticity
- ▲ Short-chain fatty acids
- ▼ Microbial diversity, e.g. Bifidobacteria, Bacteroides, Prevotella

- ▼ Firmicutes,
- ▼ Beta-glucoronidase
- ▼ Zonulin, i.e. leaky gut
- ▼ Glial activation

Butyrate

Acetate

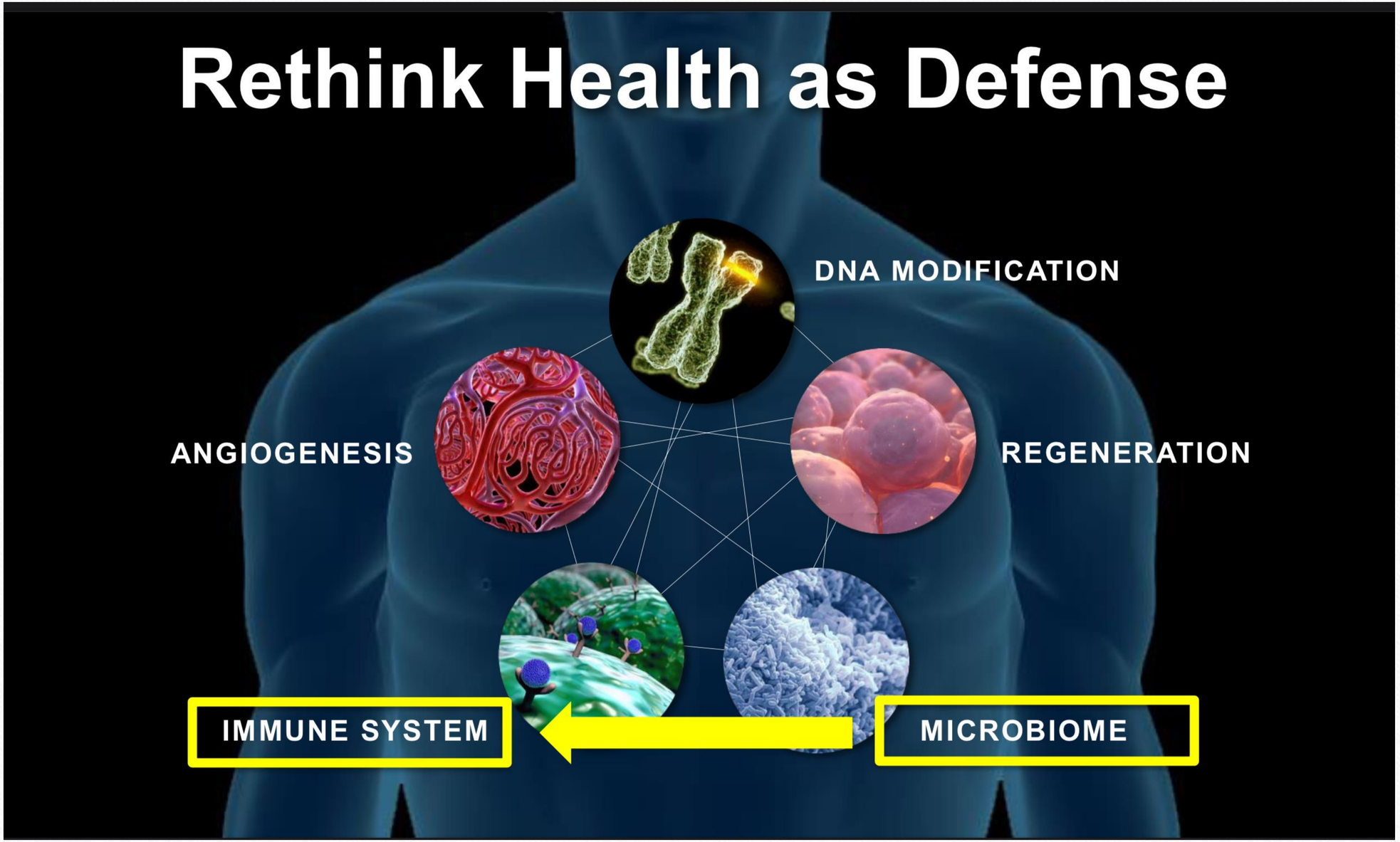
Propionate

Dysbiosis

- ▼ Neuroplasticity
- ▼ Short-chain fatty acids
- ▼ Microbial diversity, e.g. Bifidobacteria, Bacteroides, Prevotella

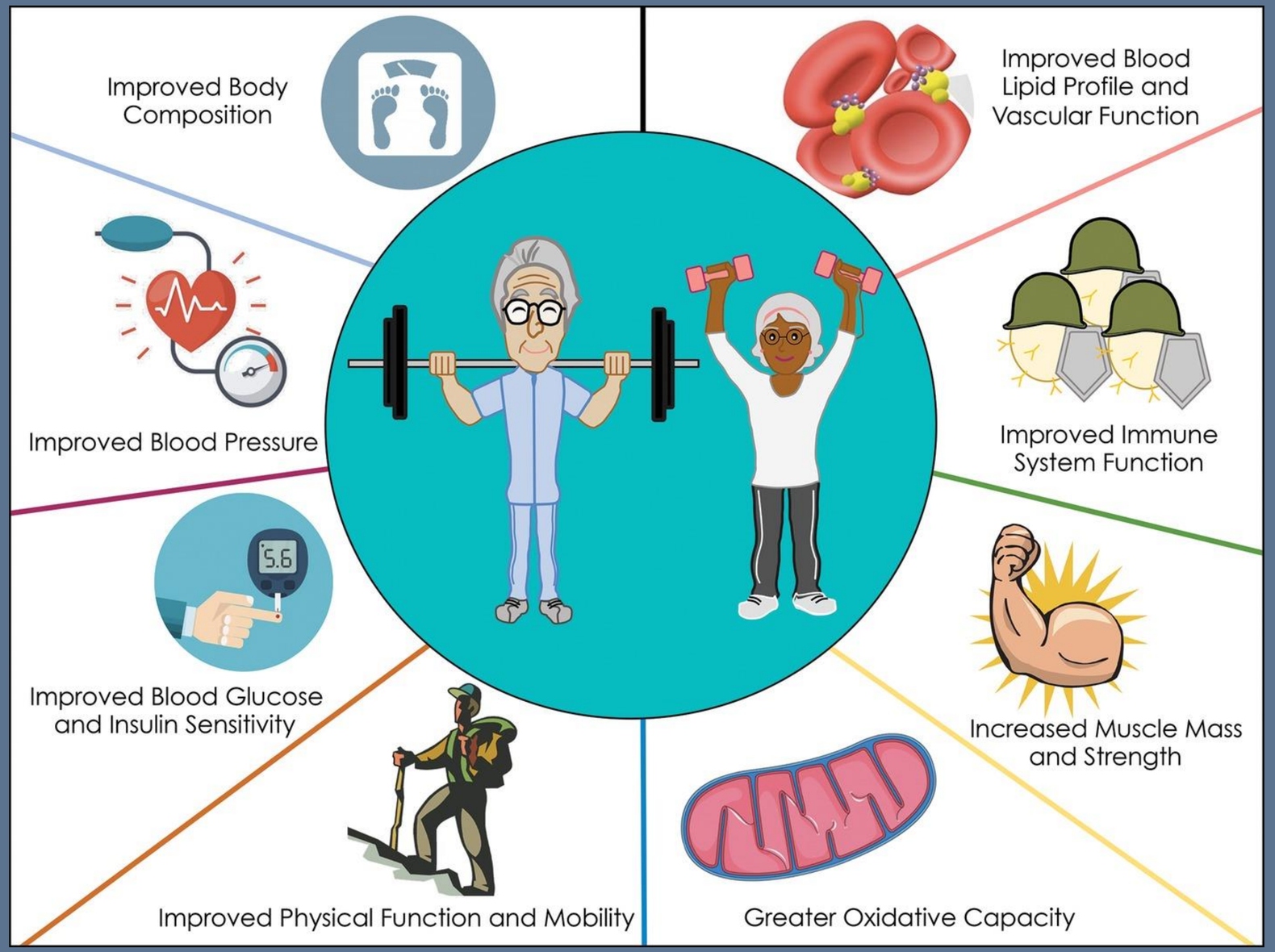
- ▲ Firmicutes,
- ▲ Beta-glucoronidase,
- ▲ Zonulin, i.e. leaky gut
- ▲ Glial activation

Rethink Health as Defense



William W. LI MD, Angiogenesis foundation


EVERY TIME YOU EAT OR DRINK, YOU ARE
EITHER FEEDING DISEASE OR FIGHTING IT.


Improved Body Composition
Improved Blood Lipid Profile and Vascular Function
Improved Blood Pressure
Improved Immune System Function
5.6
Improved Blood Glucose and Insulin Sensitivity
Increased Muscle Mass and Strength
Improved Physical Function and Mobility
Greater Oxidative Capacity

Walking for Longevity/ Key Health Benefits:

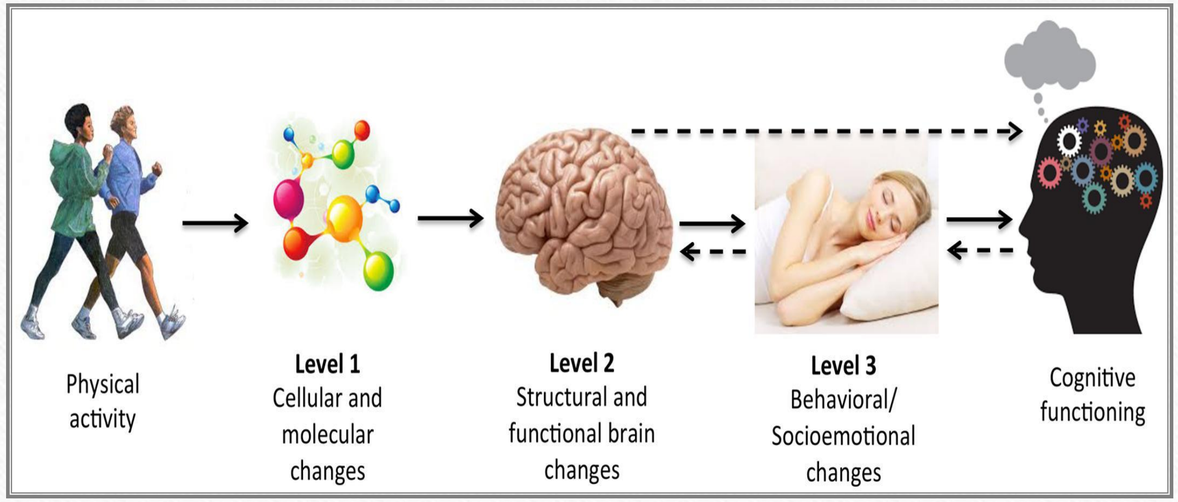
•**Cardiovascular:** Lowers heart disease, improves circulation, and heart rate variability.
•**Metabolic:** Regulates blood sugar, reduces diabetes risk, enhances fat metabolism.
•**Cognitive & Mental Health:** Supports brain function, reduces dementia risk, improves mood.
•**Musculoskeletal:** Strengthens bones, maintains muscle mass, prevents falls.

Cellular & Molecular Mechanisms
•Boosts mitochondrial function and energy production.
•Reduces oxidative stress and chronic inflammation.
•Activates longevity-related genes for healthy aging.

Practical Applications & Conclusion
•**Recommendations:** Aim for 150+ minutes of walking weekly.
•**Integration:** Walk during daily routines (meetings, stairs, nature walks).
•**Takeaways:** Walking enhances multiple body systems, promoting long-term health.

•Ungvari Z, Fazekas-Pongor V, Csiszar A, Kunutsor SK. The multifaceted benefits of walking for healthy aging: from Blue Zones to molecular mechanisms. Geroscience. 2023 Dec;45(6):3211-3239. doi: 10.1007/s11357-023-00873-8. Epub 2023 Jul 26. PMID: 37495893; PMCID: PMC10643563.

"Two weeks of exercise alters neuronal extracellular vesicle insulin signaling proteins and pro-BDNF in older adults with prediabetes" by Malin et al., published in *Aging Cell* in January 2025



Groundbreaking new study that showed that specialized brain cells involved in the body's insulin response are activated after exercise, suggesting that exercise may work to improve cognition and memory by improving the abilities of insulin to act on the brain.

Study Overview

- Study: Investigates effects of 2 weeks of exercise on neuronal insulin signaling and pro-BDNF
- Participants: Older adults with prediabetes
- Published in: Aging Cell (2025)
- Hypothesis: Short-term exercise improves brain-related insulin signaling and reduces dementia risk

Key Findings

- Two weeks of exercise improved insulin sensitivity
- Enhanced neuronal insulin signaling response to glucose ingestion
- Decreased levels of pro-BDNF, a precursor linked to cognitive decline
- Exercise-induced changes suggest a protective effect against dementia

Conclusion

- Short-term exercise improves brain insulin signaling and lowers pro-BDNF levels
- Findings suggest exercise may lower the risk of Alzheimer's Disease and Related Dementia (ADRD)
- Future research needed to explore long-term effects

Malin SK, Battillo DJ, Beeri MS, Mustapic M, Delgado-Peraza F, Kapogiannis D. Two weeks of exercise alters neuronal extracellular vesicle insulin signaling proteins and pro-BDNF in older adults with prediabetes. Aging Cell. 2025 Jan;24(1):e14369. doi: 10.1111/acel.14369. Epub 2024 Oct 18. PMID: 39421964; PMCID: PMC11709104.

What is Health/Welllness

What People Think it is:

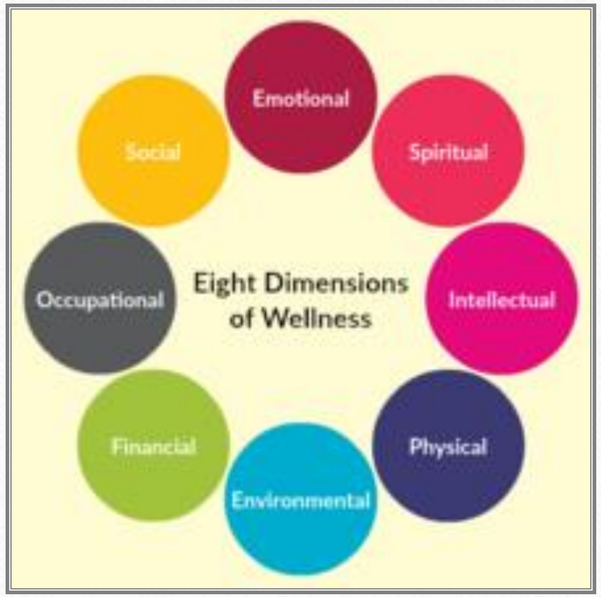
- Eating Clean
- Exercising

What it actually is:

Eating Clean, Exercising, Social Connection, Relationships, Emotional Wellbeing, Purpose, Joy & Pleasure, Boundaries, New Learning, Stress Management, Rest and Recovery, Creativity, etc

Important Health Hacks

- We have discussed Health
- Now let's talk about wellness



Gratitude


Gratitude as Medicine:
A Survival Kit
for Health Care Organizations
THE GREATER GOOD SCIENCE CENTER AT UC BERKELEY

Why Gratitude Matters in Health Care

THE GREATER GOOD SCIENCE CENTER AT UC BERKELEY

- UC Berkeley has published a resource for healthcare providers on what the research says about the practice of gratitude in health

Why Gratitude in Health Care?

"Gratitude is a vaccine, an antitoxin, and an antiseptic."

~ John Henry Jowett, 1863-1923

Gratitude and Health

Improves

- Sleep
- Tendency to exercise
- Cardiovascular health
- Adherence to medication
- Mood, optimism, hope

Reduces

- Substance abuse
- Fat intake
- Cortisol
- Blood pressure
- Suicidal thoughts
- Inflammation
- Perceived stress and depression in health care providers

Greater Good Science Center

Gratitude Helps Patients

Study by Wong, Owen, Gabana & Gilman (2015):

Adults & college students receiving mental health counseling (for depression/anxiety) were given these additional therapies:

- Group 1: Write 1 letter of gratitude to another person weekly for 3 weeks
- Group 2: Write about their deepest thoughts and feelings about stressful experiences
- Group 3: No writing activity

RESULTS:

- Group 1 reported significantly better mental health than the other groups 1 month after the writing exercise ended, then again 3 months after

Greater Good Science Center

Gratitude Helps Patients

Study by Redwine et. al. (2016):

Patients with Stage B heart failure were studied:

- Took blood samples
- Measured heart rates
- 50% of study participants kept a daily gratitude journal

RESULTS:

- Those who kept gratitude journals showed fewer biological signs that their heart disease was getting worse
- Showed healthier resting heart rate while journaling in the lab

Greater Good Science Center

Gratitude and Health Care Providers

43% of nurses and **more than half** of physicians say they have struggled with BURNOUT.

Burnout is a complex state of being, generally defined by:

- Emotional exhaustion
- cynicism and callous attitudes towards others
- a reduced ability to be effective in our jobs and relationships.

Greater Good Science Center

Gratitude Helps Health Care Providers

Study by Cheng, Tsui & Lam (2015):

Health care providers twice weekly wrote down things for which they were grateful.

RESULTS:

- Reductions in perceived stress (28%) and depression (16%) in health care practitioners
- "Such positive effects can also lead to an improvement in both productivity and quality of patient services."

Greater Good Science Center

HEALTH BENEFITS OF GRATITUDE

1. IMPROVES SLEEP QUALITY
2. DECREASES BLOOD PRESSURE IN THOSE WITH HYPERTENSION
3. INCREASES YOUR ENERGY LEVELS
4. REDUCES STRESS AND DEPRESSIVE SYMPTOMS
5. HELPS YOU LIVE LONGER

HOW TO SHOW GRATITUDE

1. GIVE OUT COMPLIMENTS
2. MAKE A LIST OF THINGS YOU ARE GRATEFUL FOR
3. VOLUNTEER IN YOUR COMMUNITY
4. DO SMALL RANDOM ACTS OF KINDNESS
5. SMILE!

SOURCES: http://happierhuman.com/research-review-the-value-of-positive-psychology-for-health-psychology-progress-and-pitfalls-in-examining-the-relation-of-positive-phenomena-to-health/ | http://time.com/5026174/health-benefits-of-gratitude/ | http://abcnews.go.com/Lifestyle/thanksgiving-tradition-gratitude-good-health-research/story?id=51113064

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PUBLISHED SINCE 1953

Clin Orthop Relat Res. 2016 Dec; 474(12): 2594–2597.
Published online 2016 Sep 29. doi: 10.1007/s11999-016-5100-0

PMCID: PMC5085955
PMID: 27687488

Your Best Life: Breaking the Cycle: The Power of Gratitude

John D. Kelly, IV, MD

Surgeon Dr. John D. Kelly, IV explains how he transformed his life with the practice of gratitude. “The brain is plastic and its inner circuitry can be changed. Past history, genetics, traumatic experiences, and years of learned behaviors can be neutralized with a decision to practice gratitude. The brain can literally be rewired to more easily transmit circuits associated with generation of good feelings.”

MINDFULNESS: A Path to Wellbeing

A Harvard Medical School Special Health Report Mindfulness: A path to well-being

Rono Leonard

HARVARD MEDICAL SCHOOL

What is mindfulness

- Maintaining a moment-by-moment awareness of our thoughts, feelings, bodily sensations, and surrounding environment through a gentle, nurturing lens
- Paying attention to our thoughts and feelings without judging them
- Roots in Buddhist meditation, professor emeritus Jon Kabat-Zinn, founder and former director of the stress reduction clinic at the University of Massachusetts Medical Center, brought the practice of mindfulness meditation into mainstream
- Shown in studies to improve physical and mental health

Clinical Trial > Psychiatry Res. 2011 Jan 30;191(1):36-43.
doi: 10.1016/j.pscychresns.2010.08.006. Epub 2010 Nov 10.

Mindfulness practice leads to increases in regional brain gray matter density

Britta K Hölzel [1], James Carmody, Mark Vangel, Christina Congleton, Sita M Yerramsetti, Tim Gard, Sara W Lazar

Affiliations – collapse

Affiliation

1 Massachusetts General Hospital, Harvard Medical School, Boston, MA, USA.
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PMID: 21071182 PMCID: PMC3004979 DOI: 10.1016/j.pscychresns.2010.08.006

Free PMC article

JOURNAL OF Glaucoma
Official Journal of the World Glaucoma Association

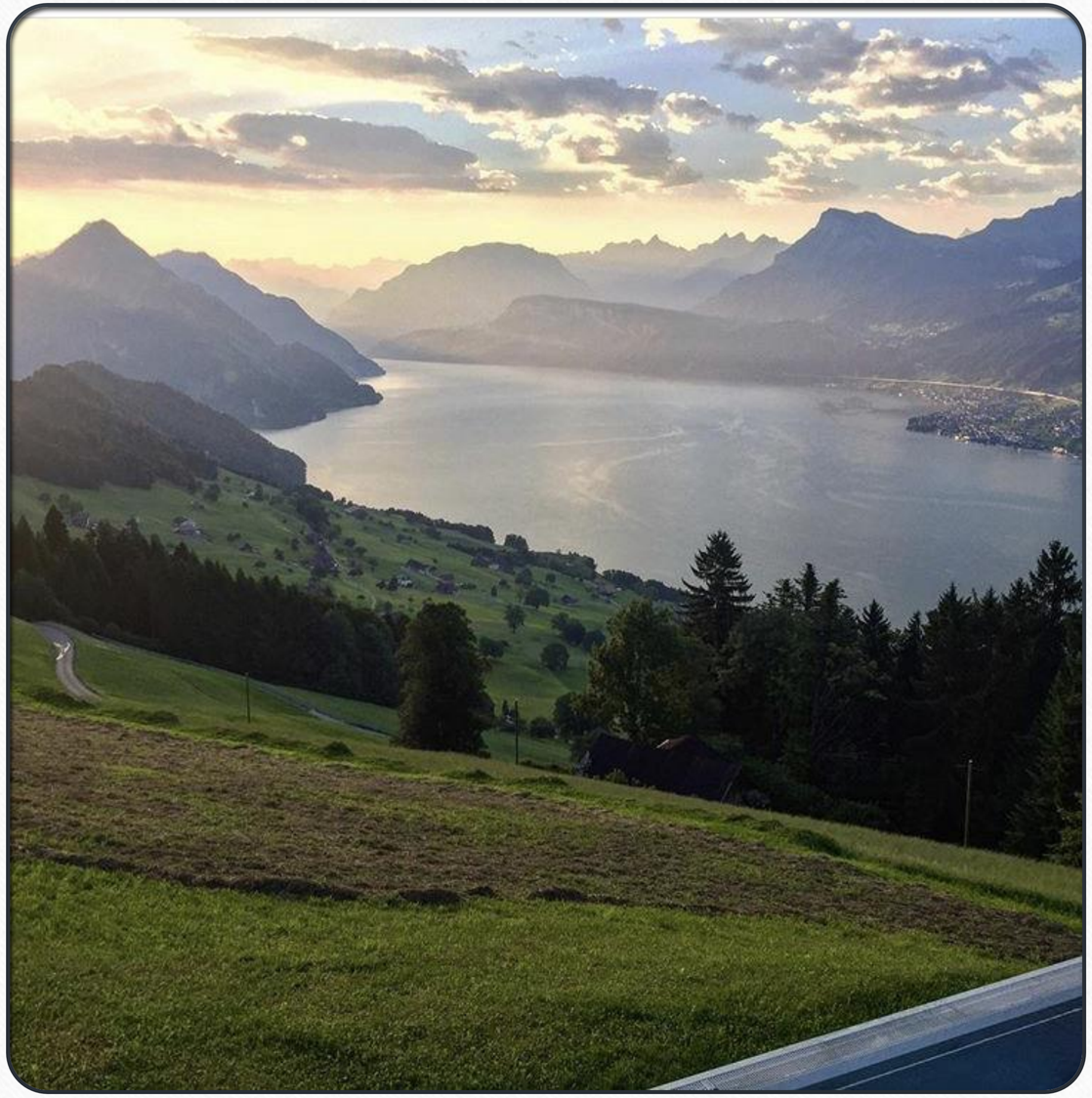
Mindfulness Meditation Reduces Intraocular Pressure, Lowers Stress Biomarkers and Modulates Gene Expression in Glaucoma: A Randomized Controlled Trial

Dada, Tanuj MD[*]; Mittal, Deepti MD[*]; Mohanty, Kuldeep PhD[*,†]; Faiq, Muneeb A. PhD[*,†]; Bhat, Muzaffer A. MSc[‡]; Yadav, Raj K. MD[‡]; Sihota, Ramanjit MD[*]; Sidhu, Talvir MD[*]; Velpandian, Thirumurthy PhD[*]; Kalaivani, Mani PhD[§]; Pandey, Ravindra M. PhD[§]; Gao, Ying MSc[‖]; Sabel, Bernhard A. PhD[‖]; Dada, Rima MD, PhD[†]

Results:
Between-group comparisons revealed significantly lowered IOP in meditators (OD: 18.8 to 12.7, OS 19.0 to 13.1 mm Hg) which correlated with significantly lowered stress-biomarker levels including cortisol (497.3 to 392.3 ng/mL), IL6 (2.8 to 1.5 ng/mL), TNF-α (57.1 to 45.4 pg/mL), ROS (1625 to 987 RLU/min/104 neutrophils), and elevated β-endorphins (38.4 to 52.7 pg/mL), BDNF (56.1 to 83.9 ng/mL), and TAC (5.9 to 9.3) (all *P*<0.001). These changes correlated well with gene expression profiling. Meditators improved in QOL (*P*<0.05).

Conclusions:

A short course of mindfulness-based stress reduction by meditation in POAG, reduces IOP, improves QOL, normalizes stress biomarkers, and positively modifies gene expression. Mindfulness meditation can be recommended as adjunctive therapy for POAG.



“Mindfulness helps you fall in love with the ordinary”
~Thich Nhat Hanh~

4 Key Habits to Do Every Day

TIME

THANKFULNESS

INSPIRATION

MEDITATION

EXERCISE

www.jayshetty.me

MedCrave
Step into the World of Research

Journal of Nutritional Health & Food Engineering

Opinion

Open Access

CrossMark

Genetics loads the gun, lifestyle pulls the trigger

Volume 3 Issue 2 - 2015

Opinion

I just finished watching a presentation by Barbara O'Neill called The True Cause of Diseases. Pretty amazing presentation but one of her statements, amongst many, really grabbed my attention: "Genetics Loads the Gun, Lifestyle Pulls the Trigger". What a profound statement, just THINK about it's implications!

Most people think that Lifestyle means the lives of the rich and famous and never think about how they live their lives. That is lifestyle, how you choose to live your life on a daily basis. What you do, what you eat, how you interact with others; that is Lifestyle. It is the force, an energy that defines all living things, that surrounds and penetrates living beings and is structured by the genetic code and fueled/directed by what you eat. Lifestyle is focused by how you act, how you interact with your environment and how active you are.

Genes are not always destiny. For multi-genetic diseases like AMD, lifestyle can modulate gene expression. Hence the science of Epigenetics.

Nutrition in Medicine, The Time to Act is Now

- **On Wednesday May 27, 2020, The National Institute of Health released a strategic plan to accelerate nutrition research over the next 10 years…**
- **Their focus is on Precision Nutrition…**
- **Led by Dr Francis Collins, head of the NIH, and also head of the Human Genome Project which took 15 years to complete and while it answered many questions, many more emerged such as how our environment through food and lifestyle affects gene expression….Epigenetics**

"With the emerging knowledge that our environment and food can alter gene expression, it is only fitting that Dr. Collins will be the head of the new NIH 10 year project in precision nutrition"….

Harvard Longitudinal Study of Adult Development

Age 19

Age 47

Age 87

Started in 1938
724 young men

Here's what the researchers set out to do:

- For more than 75 years, the Grant and Glueck study tracked the physical and emotional health of 724 people in two very diverse groups.

- The Grant Study followed 456 people who grew up in Boston's poorest neighborhoods— many living in tenements— beginning in 1939.

- The Glueck Study followed 268 graduates from Harvard's classes of 1939-1944.

- The study began when the subjects were teenagers and followed them into their eighties.

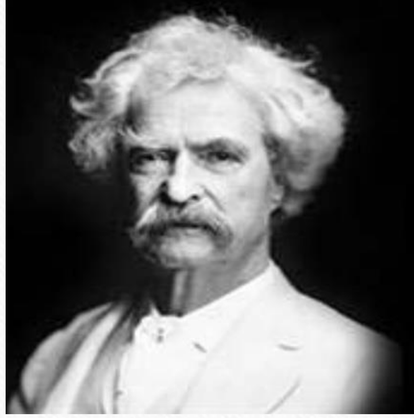
Here's an amazing part of the study. It didn't just involve annual questionnaires. Researchers went to participants' homes and sat in their living rooms. They talked about work, home life and health. They talked with the spouses and children of the subjects, and they reviewed medical records.

The subjects also had blood draws and brain scans over several decades to compare physical factors.

"The clearest message that we get from this 75-year study is this: Good relationships keep us happier and healthier. Period."—*Robert Waldinger, director of the Harvard Study of Adult Development*

The health of relationships was a greater predictor of health and well-being than smoking or diet….period. Relationships matter.

It ain't what you don't know that gets you into trouble. It's what you know for sure that just ain't so.



Mark Twain

American Author and Humorist

(1835-1910)

QuoteHD.com