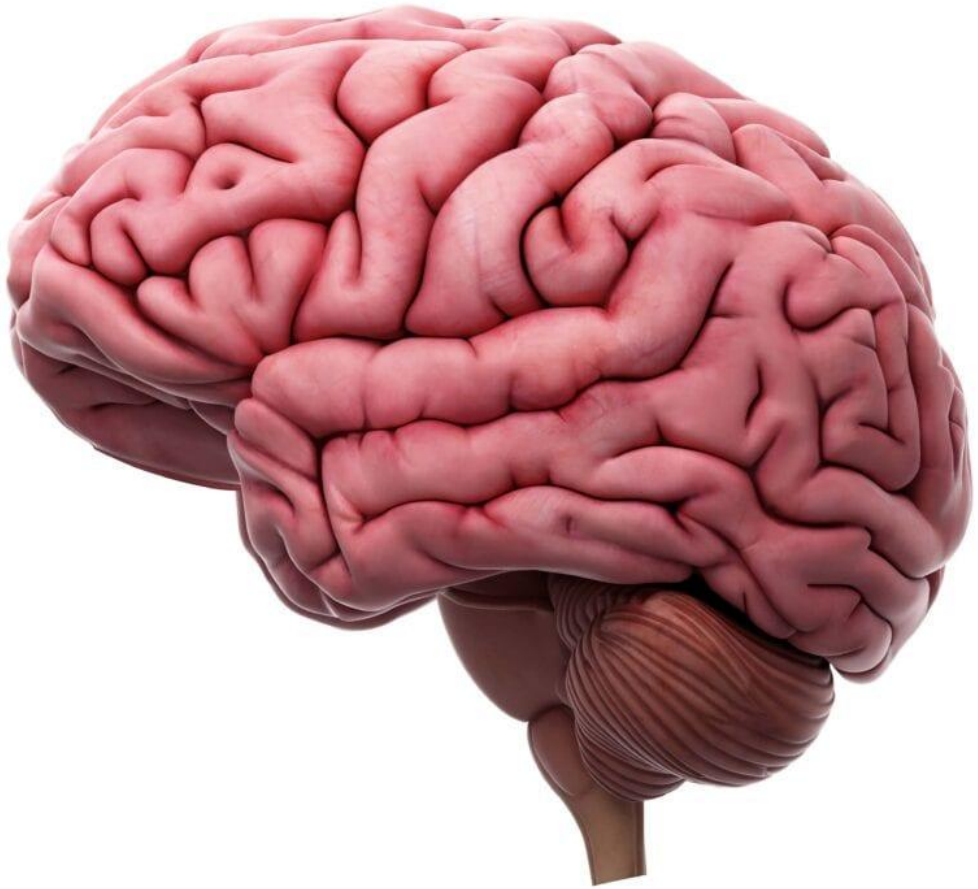


Neuroplasticity - How the Brain Repairs Itself

Explore the incredible ability of the brain to adapt, change, and repair itself throughout our lives.

METABOLIC **HEALTH**
Arizona

LIFE'S BEST MEDICINE
PODCAST
WITH BRIAN LENZKES, MD

LOW CARB MD
PODCAST
WITH
With Dr. Tro and Dr. Lenzkes

Disclosures

(None relevant to this talk)

01

I have no financial interest in the pharmaceutical industry

02

I practice general Internal Medicine in San Diego, CA and Prescott, AZ

03

Using Low Carb / Keto / IF therapeutic approaches & this is my dietary bias

04

Life's Best Medicine Podcast is sponsored by HLTH Code (Production Costs)

What is Neuroplasticity?

Brain's Dynamic Ability

The brain's remarkable capacity to adapt, change, and reorganize its structure and function in response to new experiences, learning, and environmental influences.

Neuronal Reorganization

Neuroplasticity involves the creation of new neural pathways, strengthening of existing connections, and pruning of unused connections within the brain.

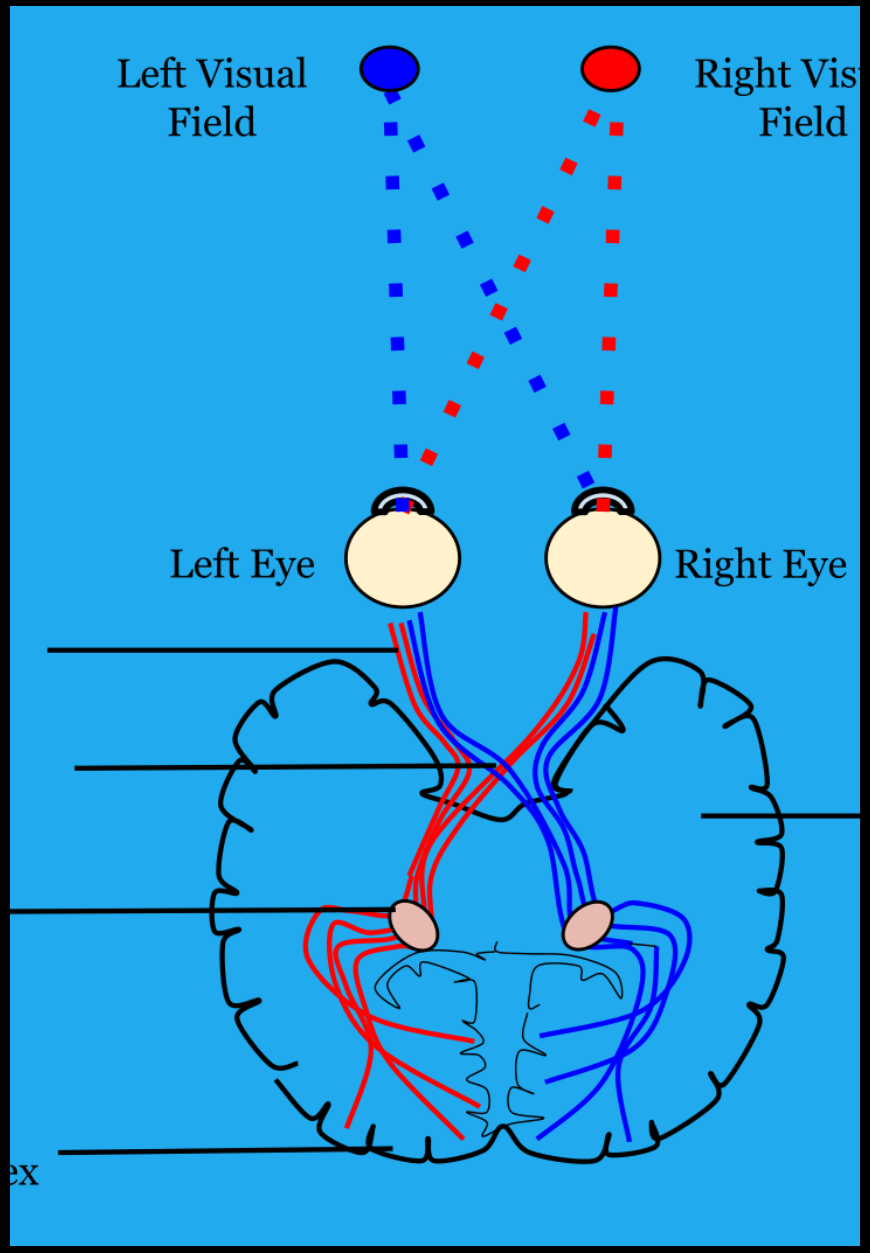
Lifelong Process

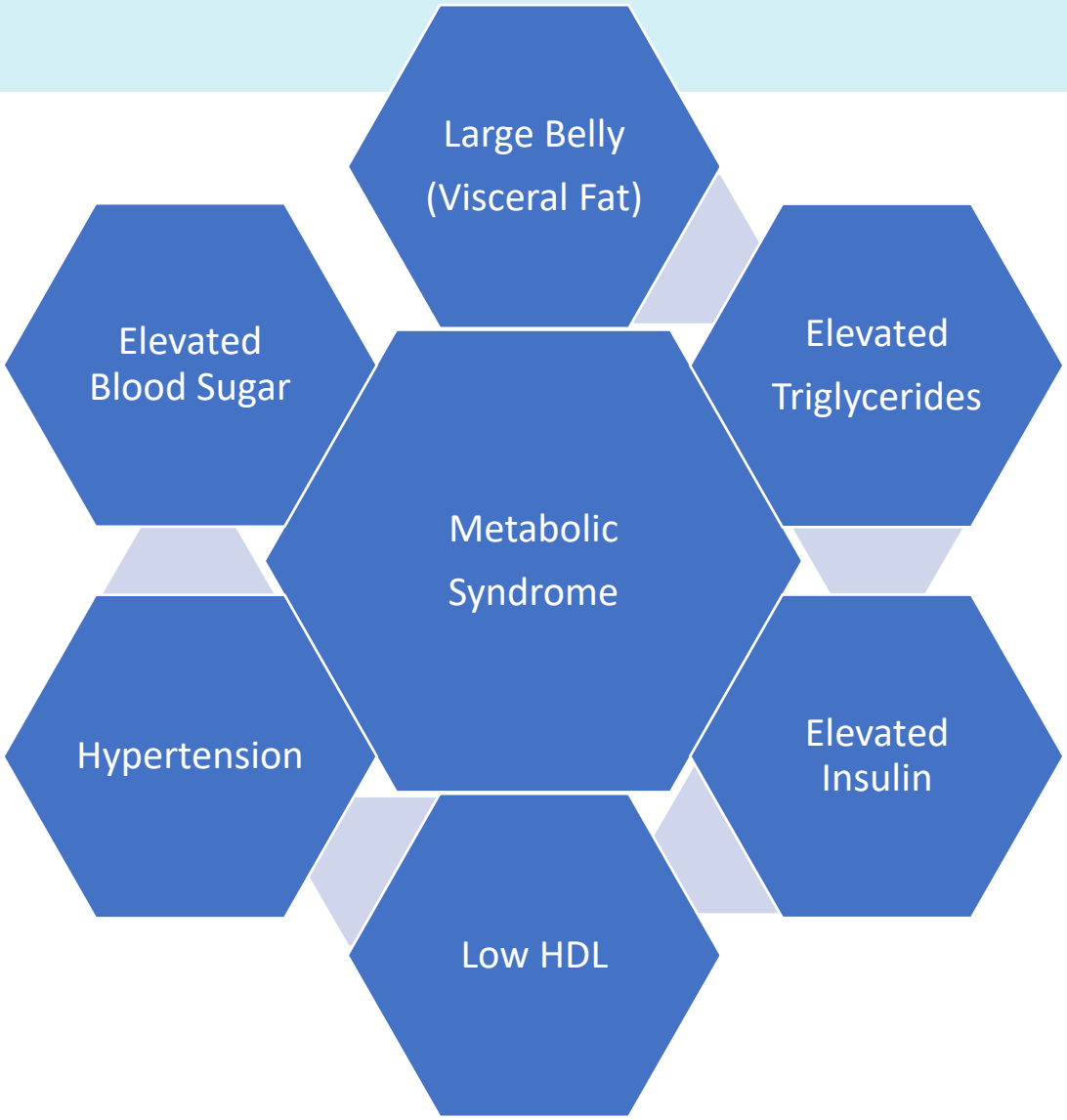
Neuroplasticity is a continuous process that occurs throughout an individual's lifespan, allowing the brain to adapt and evolve in response to changing demands and experiences.

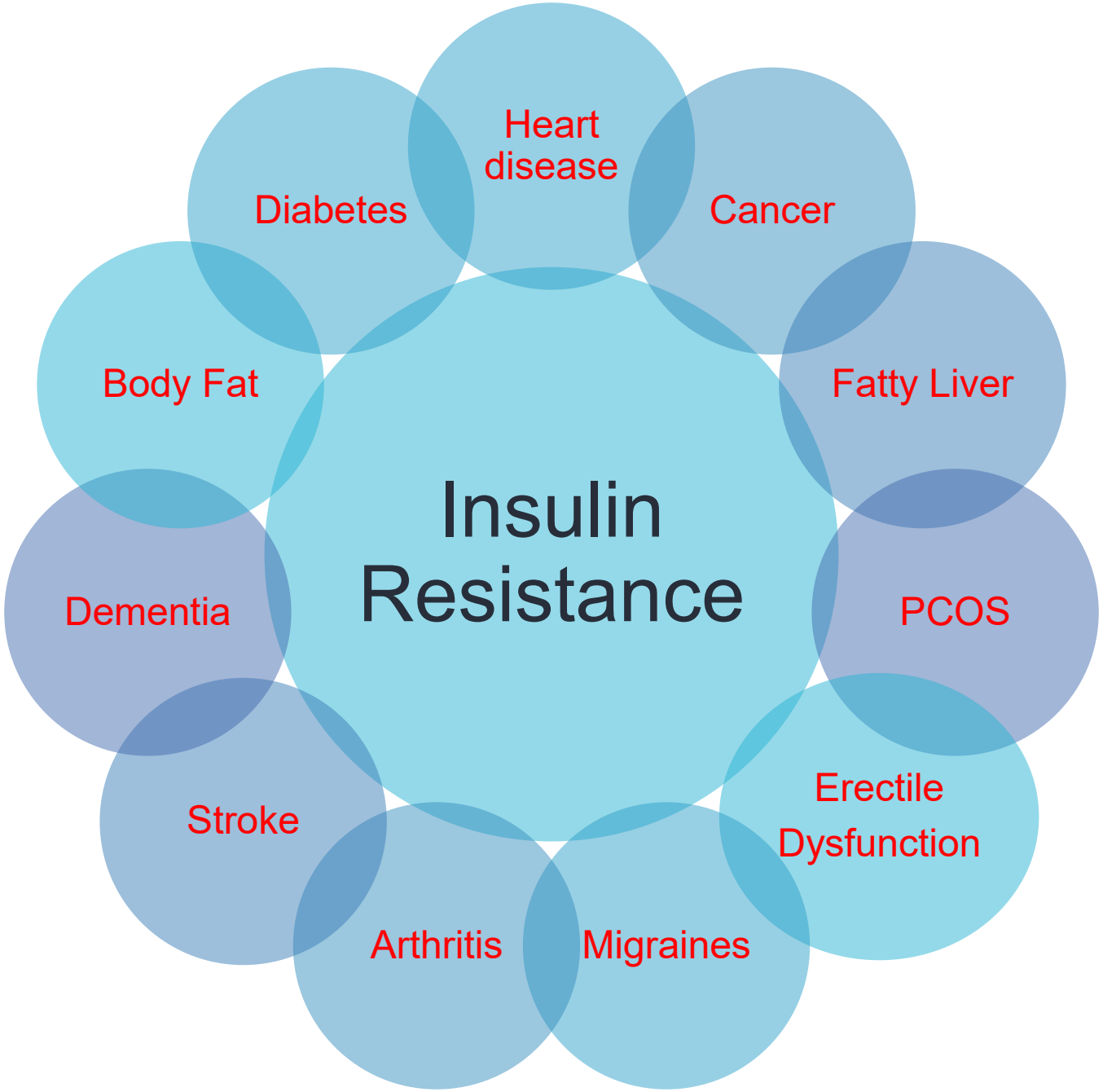
Neuroplasticity is the brain's remarkable ability to reorganize and modify its structure and function in response to experience, learning, and environmental factors, enabling the brain to adapt and thrive throughout one's lifetime.

The Science of Neuroplasticity

Neuroplasticity is the remarkable capacity of the brain to continuously adapt and reorganize its structure and function in response to changes in behavior, environment, and neural processes. This dynamic process involves the creation of new neural pathways, the strengthening of existing connections, and the pruning of unused connections, enabling the brain to learn, grow, and recover from injury.




Large Belly
(Visceral Fat)
Elevated
Blood Sugar
Elevated
Triglycerides
Metabolic
Syndrome
Hypertension
Elevated
Insulin
Low HDL


Insulin Resistance
Heart disease
Cancer
Fatty Liver
PCOS
Erectile Dysfunction
Migraines
Arthritis
Stroke
Dementia
Body Fat
Diabetes

Preventing Neurodegeneration

- ## Physical Exercise

  Regular physical activity, such as aerobic exercise, strength training, and flexibility exercises, can increase blood flow, stimulate the production of growth factors, and promote the formation of new brain cells and connections, all of which contribute to maintaining brain health and preventing neurodegeneration.

- ## Cognitive Stimulation

  Engaging in mentally challenging activities, such as learning new skills, playing brain-teasing games, reading, and solving puzzles, can help build cognitive reserve, strengthen neural pathways, and promote the development of new connections between brain cells, enhancing cognitive function and reducing the risk of cognitive decline.

- ## Stress Management

  Chronic stress can have detrimental effects on the brain, leading to inflammation, reduced neuroplasticity, and the degeneration of brain cells. Implementing effective stress management techniques, such as meditation, mindfulness practices, relaxation exercises, and seeking social support, can help mitigate the negative impacts of stress and support brain health.

Maintaining A Healthy Gut Microbiome/Insulin

☑ Five things:

Manage stress, get adequate sleep, avoid smoking / limit alcohol, exercise regularly, eat real food

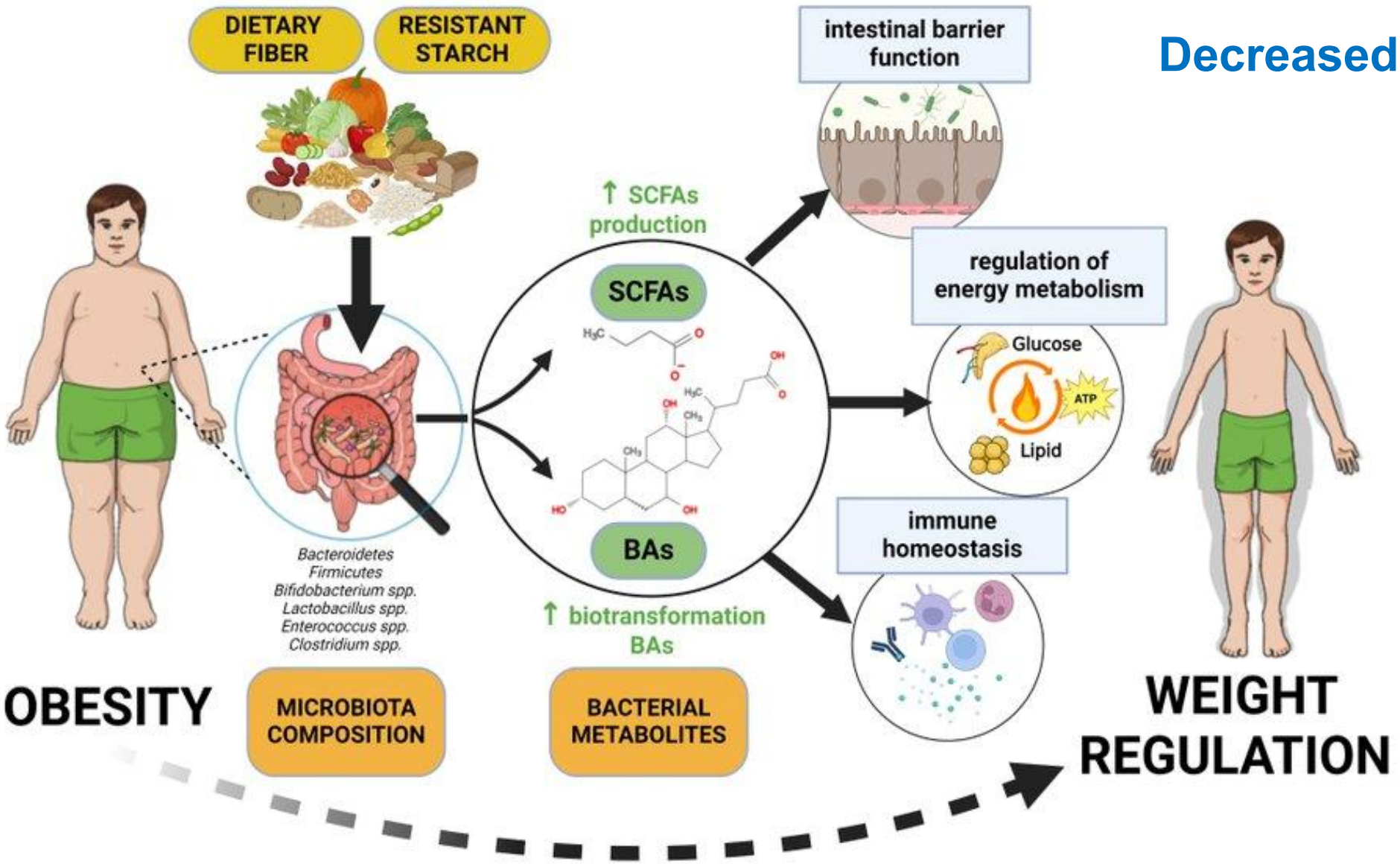
☑ Four Pillars:

Control Carbohydrates, Prioritize Protein, Don’t Fear Fat, Fasting

Dr. Ben Bikman PhD (BYU Professor and leading fat cell researcher, Author Why We Get Sick)

Gut Microbiome in Obesity

Decreased Bifidobacterium

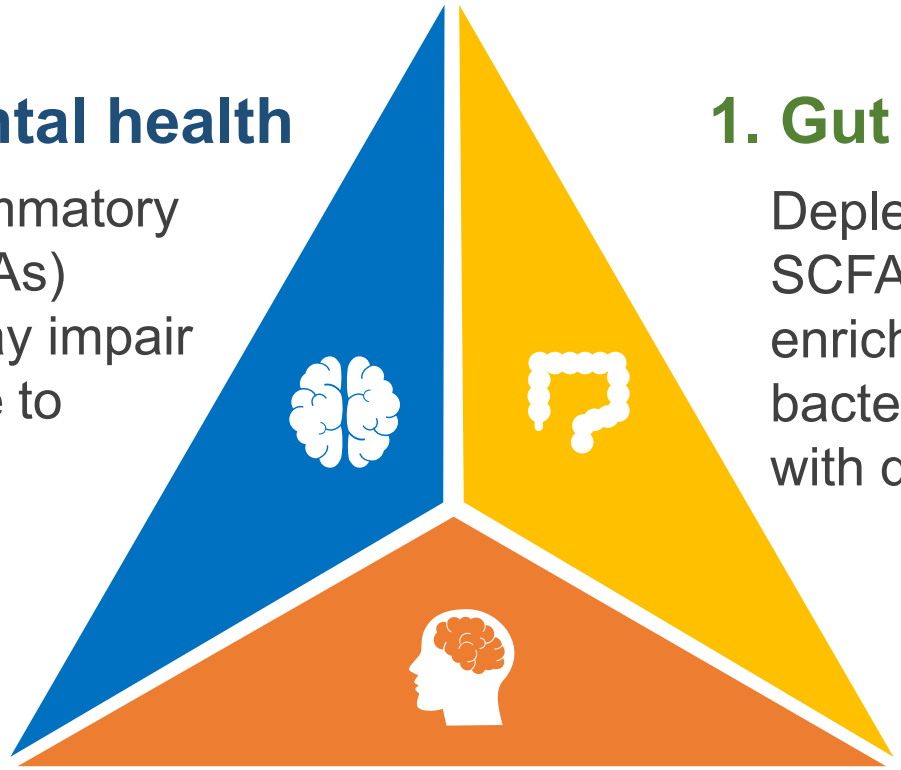


You want pipes coated with vasoline, not leaking sewage into your body

Gut Microbiota Variations in Depression and Anxiety: Systematic Review

3. SCFA depletion & mental health

Reduced levels of anti-inflammatory short-chain fatty acids (SCFAs) produced by gut bacteria may impair brain function and contribute to mental health disorders



1. Gut microbiota dysbiosis

Depletion of anti-inflammatory SCFA-producing bacteria and enrichment of pro-inflammatory bacteria observed in individuals with depression and anxiety

2. Inflammation and gut-brain axis

Pro-inflammatory gut bacteria may contribute to neuroinflammation and dysregulation of the gut-brain axis, leading to depression and anxiety

Benefits of Ketones for Gut Health

Improved Nutrient Absorption

Ketones enhance the absorption of essential vitamins, minerals, and other nutrients in the gut.

Gut Microbiome Balance

Ketones promote the growth of beneficial gut bacteria, supporting a diverse and balanced microbiome.

Reduced Inflammation

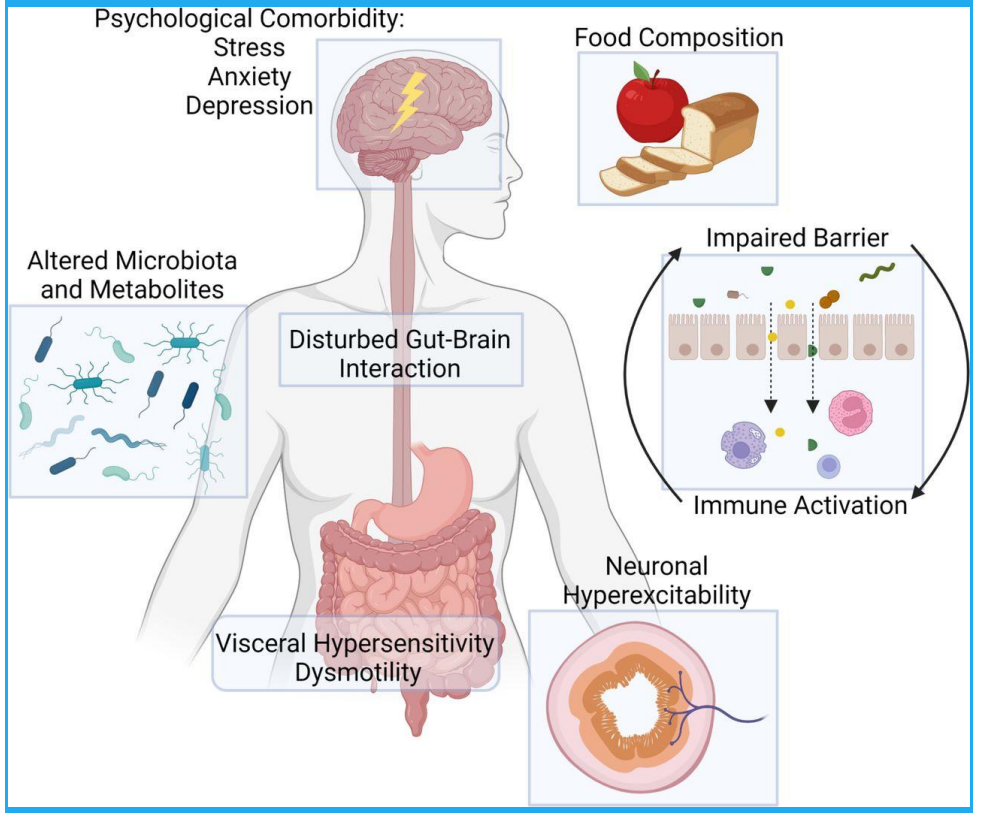
Ketones possess anti-inflammatory properties, helping to maintain a healthy gut lining and reduce inflammation.

Enhanced Gut Barrier Function

Ketones strengthen the tight junctions between gut epithelial cells, improving the integrity of the gut barrier.

The Gut-Brain Connection: A Bidirectional Relationship

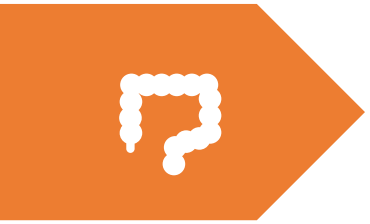
The gut and brain share a profound bi-directional relationship, with the gut microbiome exerting a significant influence on cognitive function, emotional well-being, and neurological health. Emerging research has unveiled the intricate pathways through which the gut-brain axis operates, involving the exchange of microbial metabolites, neurotransmitters, and immune signals. Understanding this symbiotic relationship is crucial for unlocking the brain's remarkable capacity for neuroplasticity and maintaining overall brain health.



Gut Microbiota, Endotoxemia, and Insulin Resistance

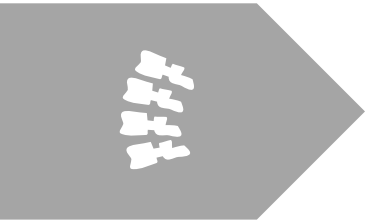
Gut microbiota and insulin resistance

The study investigated the relationship between gut microbiota, endotoxemia, and insulin resistance.



Increased intestinal permeability

The researchers found that increased intestinal permeability and endotoxemia were associated with insulin resistance.



Gut-derived endotoxins

Play a significant role in impairing insulin signaling and promoting metabolic dysfunction.

Imidazole Propionate (ImP)

A Microbiome Metabolite!

- Elevated levels in the blood have been linked to negative health outcomes

Short-chain fatty acid (SCFA)-producing bacteria like Faecalibacterium prausnitzii, Roseburia intestinalis, and Roseburia hominis lower levels.

Akkermansia muciniphila and certain Lactobacillus species (e.g., Lactobacillus reuteri) have been linked to lower ImP in intervention studies

ImP might be ImPortant!

HELICOBACTER PYLORI

H. PYLORI & VIRULENCE FACTORS	Result	Reference
Helicobacter pylori	4.45e2	< 1.00e3
Virulence Factor, babA	N/A	Negative
Virulence Factor, cagA	N/A	Negative
Virulence Factor, dupA	N/A	Negative
Virulence Factor, iceA	N/A	Negative
Virulence Factor, oipA	N/A	Negative
Virulence Factor, vacA	N/A	Negative
Virulence Factor, virB	N/A	Negative
Virulence Factor, virD	N/A	Negative

COMMENSAL/KEYSTONE BACTERIA

COMMENSAL BACTERIA	Result	Reference
Bacteroides fragilis	9.58e9	1.6e9 - 2.5e11
Bifidobacterium spp.	1.52e9	> 6.7e7
Enterococcus spp.	8.91e6	1.9e5 - 2.0e8
Escherichia spp.	1.43e7	3.7e6 - 3.6e9
Lactobacillus spp.	3.06e7	8.6e5 - 6.2e8
Enterobacter spp.	4.87e7	1.0e6 - 5.0e7
Akkermansia muciniphila	3.60e5	1.0e1 - 8.2e6
Faecalibacterium prausnitzii	5.94e4	1.0e3 - 5.0e8
Roseburia spp.	3.53e9	5.0e7 - 2.0e10

BACTERIAL PHYLA		
Bacteroidetes	1.72e12	8.6e11 - 3.3e12
Firmicutes	1.12e11	5.7e10 - 3.0e11
Firmicutes:Bacteroidetes Ratio	0.07	< 1.0

OPPORTUNISTIC/OVERGROWTH MICROBES

DYSBIOTIC & OVERGROWTH BACTERIA	Result		Reference
Bacillus spp.	3.89e5		< 1.76e6
Enterococcus faecalis	<dl		< 1.00e4
Enterococcus faecium	<dl		< 1.00e4
Morganella spp.	<dl		< 1.00e3
Pseudomonas spp.	<dl		< 1.00e4
Pseudomonas aeruginosa	<dl		< 5.00e2
Staphylococcus spp.	<dl		< 1.00e4
Staphylococcus aureus	5.33e2	High ↑	< 5.00e2
Streptococcus spp.	<dl		< 1.00e3
COMMENSAL OVERGROWTH MICROBES			
Desulfovibrio spp.	1.59e8		< 7.98e8
Methanobacteriaceae (family)	7.86e7		< 3.38e8
INFLAMMATORY & AUTOIMMUNE-RELATED BACTERIA			
Citrobacter spp.	<dl		< 5.00e6
Citrobacter freundii	<dl		< 5.00e5
Klebsiella spp.	<dl		< 5.00e3
Klebsiella pneumoniae	<dl		< 5.00e4
M. avium subsp. paratuberculosis	<dl		< 5.00e3
Proteus spp.	<dl		< 5.00e4
Proteus mirabilis	<dl		< 1.00e3
COMMENSAL INFLAMMATORY & AUTOIMMUNE-RELATED BACTERIA			
Enterobacter spp.	4.87e7		< 5.00e7
Escherichia spp.	1.43e7		< 3.80e9
Fusobacterium spp.	1.04e6		< 1.00e8
Prevotella spp.	3.75e7		< 1.00e8

FUNGI/YEAST

FUNGI/YEAST	Result	Reference
Candida spp.	<dl	< 5.00e3
Candida albicans	<dl	< 5.00e2
Geotrichum spp.	<dl	< 3.00e2
Microsporidium spp.	<dl	< 5.00e3
Rhodotorula spp.	<dl	< 1.00e3

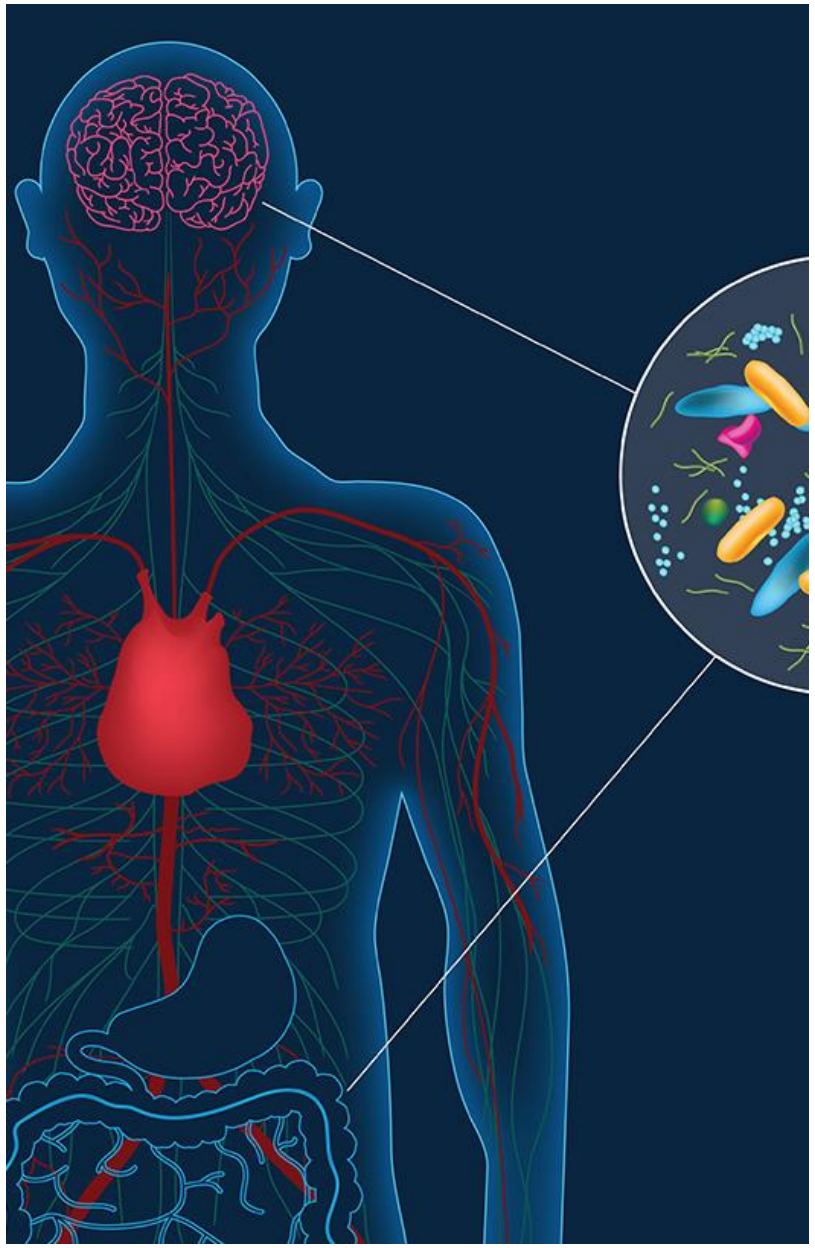
VIRUSES

VIRUSES	Result	Reference
Cytomegalovirus	<dl	< 1.00e5
Epstein-Barr Virus	<dl	< 1.00e7

Dietary Considerations for Brain Health

Nutrient	Function in the Brain	Food Sources
Omega-3 Fatty Acids	Reduce inflammation, support neuronal neuronal communication, and promote promote brain cell growth and development	Fatty fish (salmon, mackerel, sardines), walnuts, flaxseeds, chia chia seeds
Antioxidants (Vitamins C and E, E, Flavonoids)	Protect brain cells from oxidative oxidative stress and damage, which which can contribute to neurodegeneration	Fruits (berries, citrus fruits, tomatoes), vegetables (leafy greens, bell peppers, broccoli), nuts and seeds
Probiotics	Modulate the gut-brain axis, reducing inflammation and supporting cognitive function	Fermented foods (yogurt, kefir, sauerkraut, kimchi), probiotic supplements
B Vitamins (B6, B12, Folate)	Involved in energy production, red blood cell formation, and the synthesis of neurotransmitters	Whole grains, leafy greens, beans, eggs, poultry
Magnesium	Regulates neuronal excitability, supports synaptic plasticity, and may help prevent migraines	Leafy greens, nuts, seeds, whole grains, avocados

*Information compiled from various scientific sources, including the Journal of Alzheimer's Disease, Frontiers in Aging Neuroscience, and Nutrients.

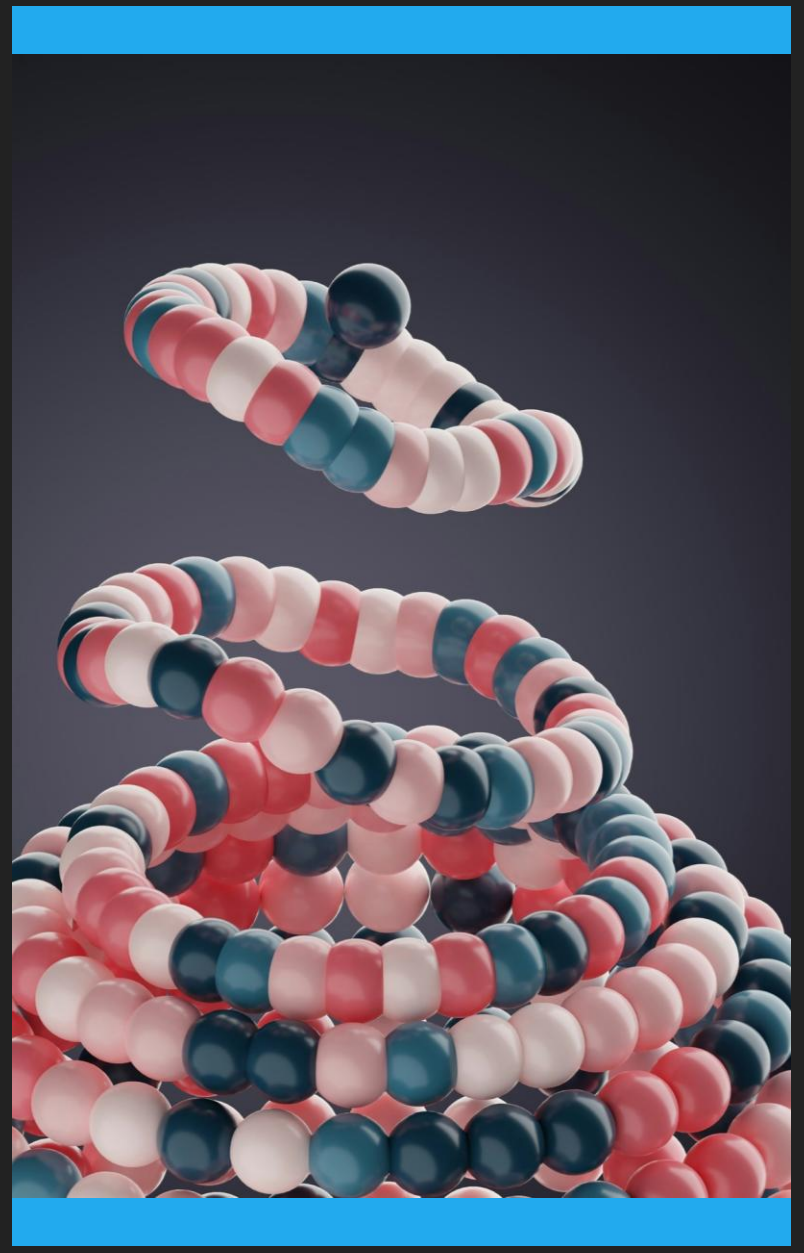


Changes in the Gut Microbiome Consistent with Parkinson's Disease

Parkinson's disease is a neurodegenerative disorder characterized by the loss of dopaminergic neurons in the brain. Emerging research suggests that changes in the gut microbiome may be an early indicator and contributing factor to the development of Parkinson's disease. Disruptions in the gut-brain axis can lead to increased inflammation, impaired neurotransmitter production, and altered neuroplasticity, which may all contribute to the progression of the disease.

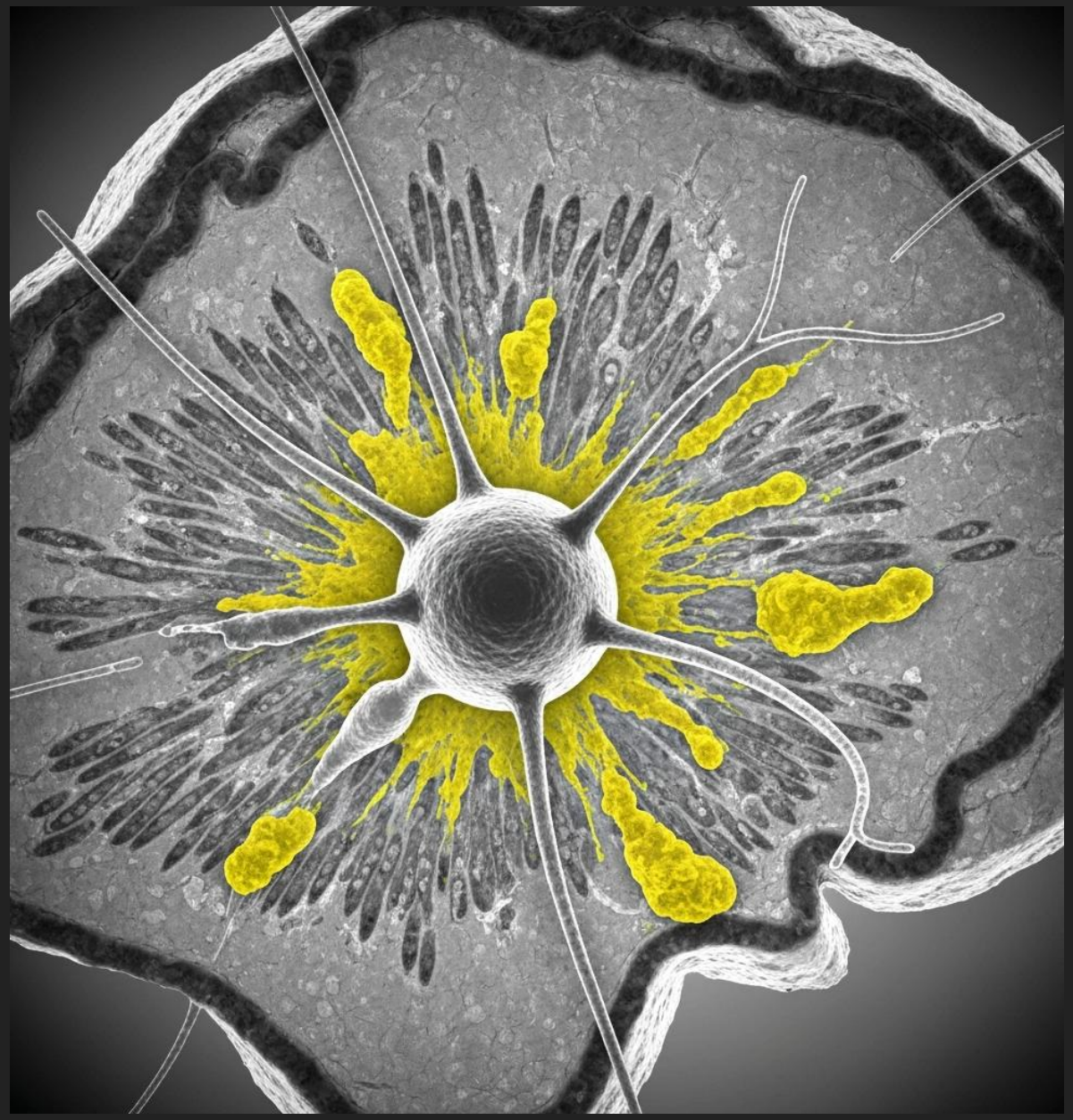
Gut Microbiome Changes Common in Alzheimer's Disease

Emerging research has revealed that Alzheimer's disease is often accompanied by significant changes in the gut microbiome. These microbial alterations can contribute to neuroinflammation, disrupted neurotransmitter production, and impaired neuroplasticity, ultimately exacerbating the progression of Alzheimer's disease.



The Importance of Cholesterol in Neuroplasticity and Neurodegeneration Prevention

Cholesterol plays a crucial role in brain health and the prevention of neurodegenerative diseases. Emerging research suggests that maintaining healthy cholesterol levels can support neuroplasticity, the brain's remarkable ability to adapt and reorganize its structure and function throughout one's lifespan. By understanding the importance of cholesterol in brain health, we can take proactive steps to safeguard our cognitive abilities and reduce the risk of devastating neurological disorders.



Neuroplasticity in Action

Stroke recovery through neuroplasticity

Stroke patients can regain function through the brain's ability to reorganize and form new neural connections

Neuroplasticity and spinal cord injury

The brain can adapt and rewire itself to regain function and mobility after spinal cord injuries

Neuroplasticity in Parkinson's disease

The brain can create new pathways to compensate for the loss of dopaminergic neurons in Parkinson's disease

Unlocking the Brain's Potential

Embrace Neuroplasticity

Understand the remarkable ability of the brain to reorganize and adapt throughout our lives, known as neuroplasticity.

Take Proactive Measures

Empower individuals to take an active role in maintaining and improving their cognitive abilities through evidence-based strategies.

Harness the Gut-Brain Connection

Explore the profound influence of the gut microbiome on brain function, cognitive abilities, and neurological disorders.

Optimize Dietary Choices

Highlight the importance of a nutrient-rich diet, omega-3 fatty acids, antioxidants, and probiotics for optimal brain health.

Prevent Neurodegeneration

Implement key strategies to maintain brain health and prevent neurodegeneration, including physical exercise, cognitive stimulation, and stress management.

Disentangling the relationship between glucose, insulin and brain health: A UK Biobank study

Andrew C. Mason PhD, Nasri Fatih PhD, Reecha Sofat PhD, Christopher T. Rentsch PhD, Liam Smeeth FRCGP, Krishnan Bhaskaran PhD, Nish Chaturvedi PhD, Victoria Garfield PhD

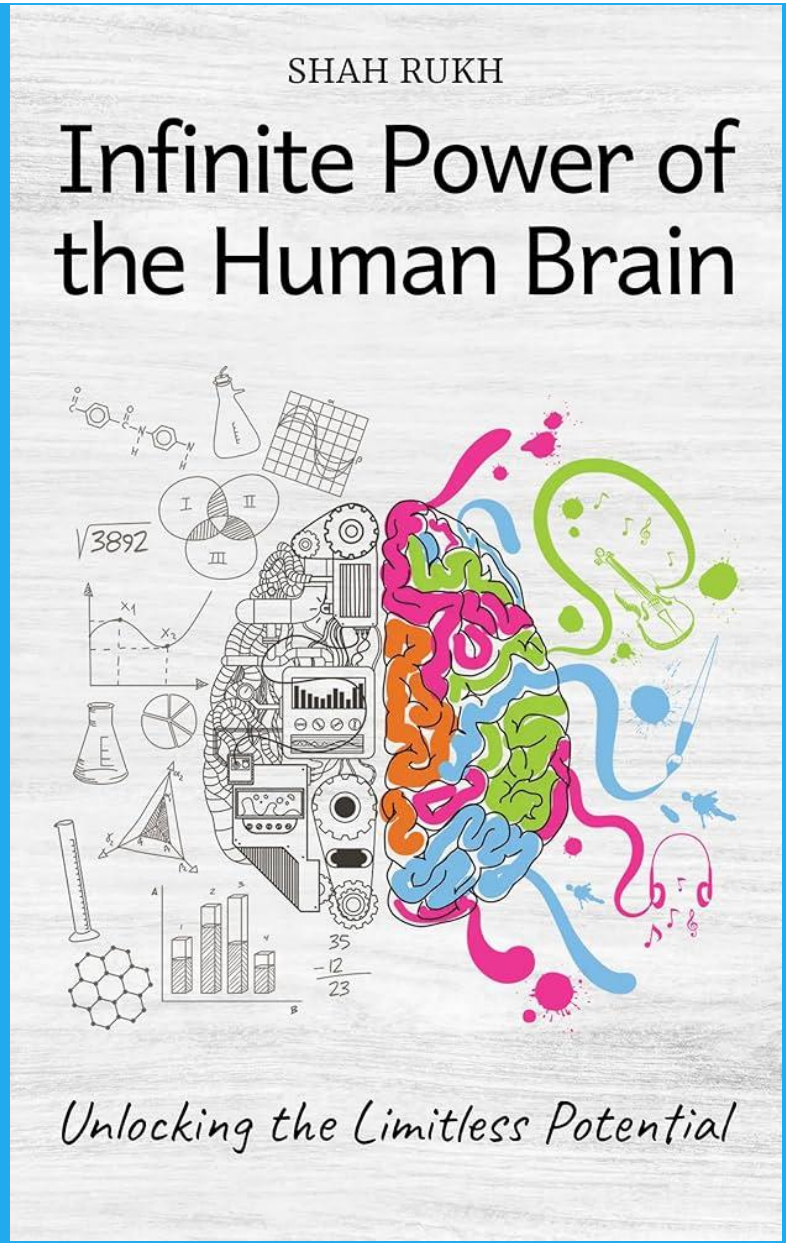
First published: 12 December 2025

https://doi.org/10.1111/dom.70353Digital Object Identifier (DOI)

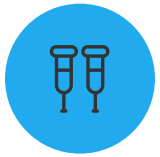
The results found that people with higher post-meal blood sugar (postprandial hyperglycemia) had a 69% greater risk of developing Alzheimer's disease.

"This finding could help shape future prevention strategies, highlighting the importance of managing blood sugar not just overall, but specifically after meals."

By harnessing the remarkable power of neuroplasticity, we can take proactive steps to prevent neurodegeneration, enhance cognitive function, and unlock the full potential of the human brain. Through a holistic approach that prioritizes the gut-brain connection and incorporates evidence-based dietary and lifestyle strategies, we can foster a healthier, more resilient brain capable of adapting and thriving throughout our lives.



Healing The Gut Microbiome



Prioritize gut health

Make gut health a top priority for overall well-being

Manage stress and sleep

Understand the importance of stress reduction and quality sleep for maintaining a healthy gut

Explore gut-friendly diet

Consider a diet rich in fiber, probiotics, and fermented foods to nourish the gut microbiome

Seek professional support

Consult with healthcare professionals, such as registered dietitians or gastroenterologists, for personalized gut health guidance

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