TRILLIOME

Reprogramming the Gut Microbiome: Precision Modulation of Keystone Species Networks

www.trilliome.com | patrick.guye@trilliome.com | since 2023

The Body's Most Programmable Organ

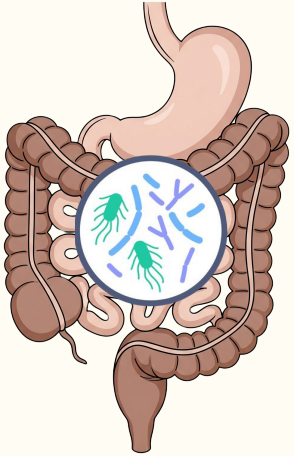
Modularity and accessibility are key properties

Metabolically Powerful: Microbiome gene pool vastly outnumbers human genes

Organ-Controlling: Regulates liver, immunity, hormones, cognition

Brain-Linked: Talks to the brain via neurons & metabolites

Programmable: Targeted inputs reshape microbial output

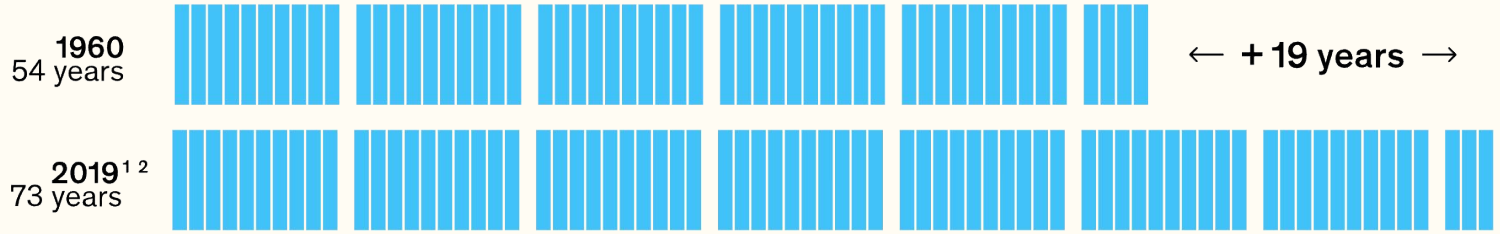


> *Think of the gut as a tech stack:*
>
> *Hardware = Intestine*
> *Firmware = Microbiome*
> *Software Updates = Bioactives*

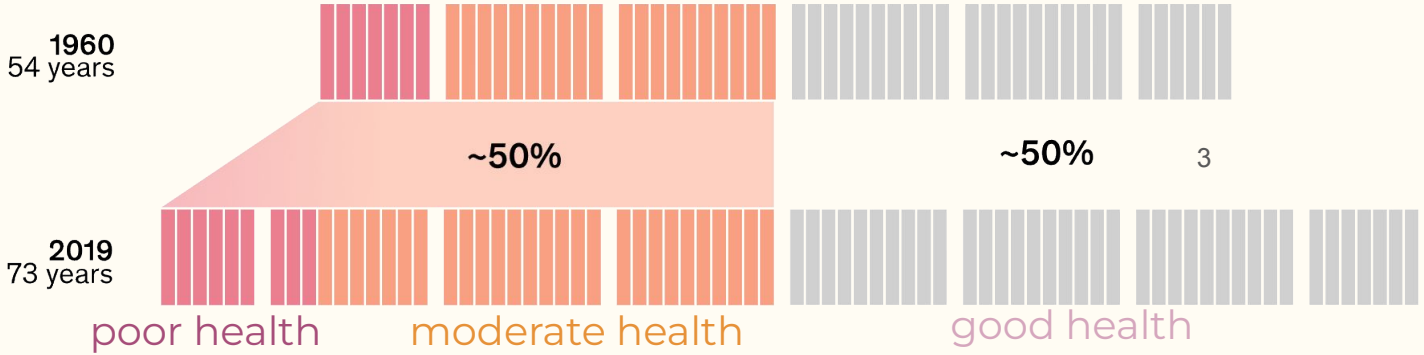
Trilliome programs the gut - to drive resilience, cognition, and longevity.

The Grand Challenge: A Healthspan crisis

We live longer... but are we living in good health?

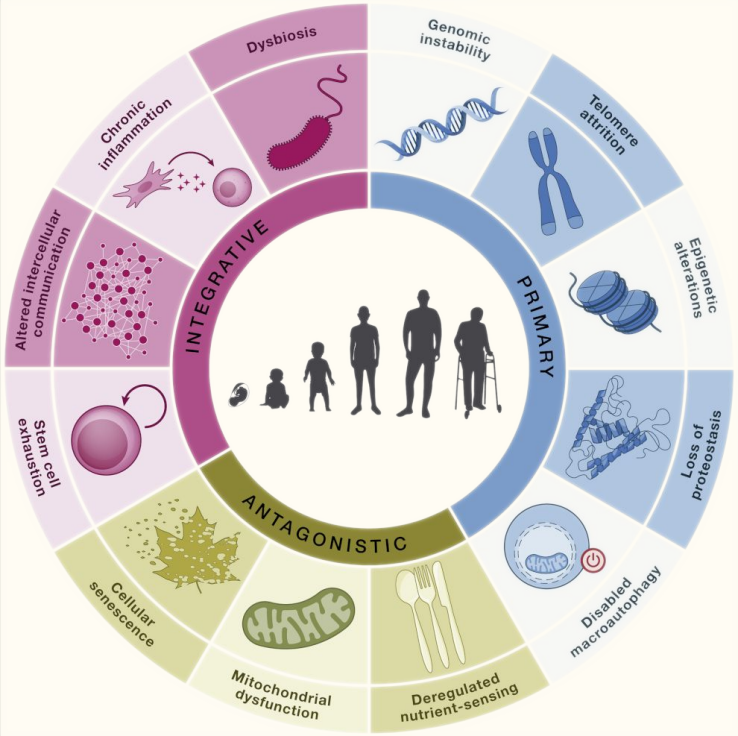


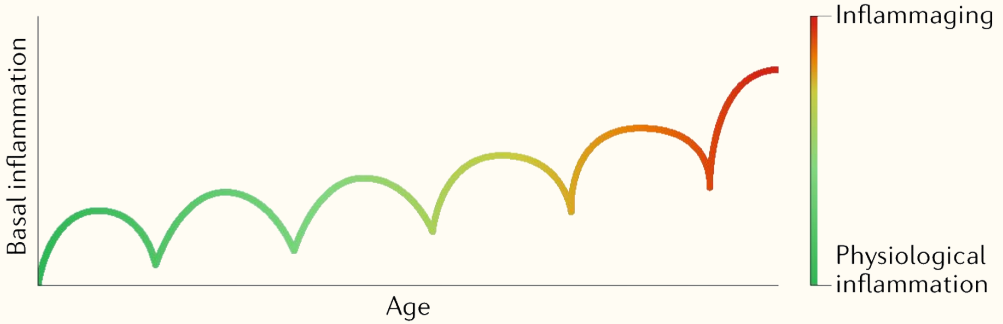
The proportion of life spent in poor or moderate health has not changed.



Source: WHO, McKinsey ("Adding years to life and life to years", 2022)

The Scientific Root Cause: System Failure

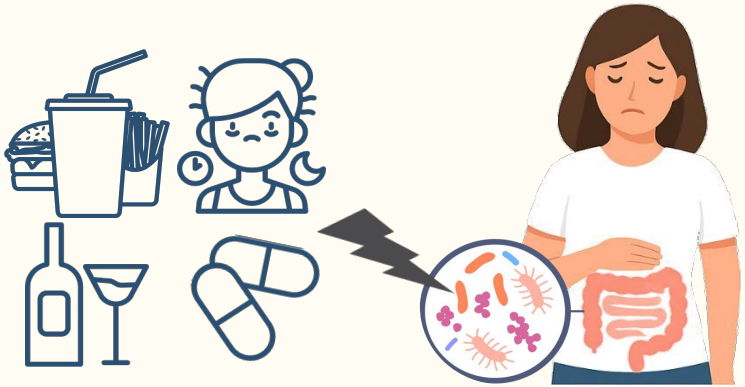




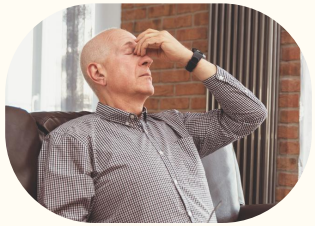
Cell, Volume 186, Issue 2, p243-278, January 19, 2023

The Hidden Driver of Unhealthy Aging

Modern Lifestyles Are Destroying the Gut Ecosystem Behind Human Health



Chronic low-grade inflammation, ‘inflammaging’, is emerging as a core driver of age-related disease.



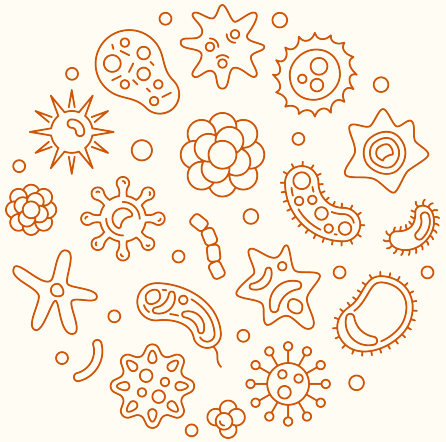
Cognitive Decline, Depression, Neurodegeneration

Weight Gain, Diabetes, Low Performance

Autoimmune Diseases, Inflammation, Allergies

Challenges in the Microbiome Product Landscape

Four problems Trilliome is built to solve



Crowded, me-too product space

Most gut–brain and healthy-aging products are minor reformulations of fibers, probiotics, or botanicals.

Weak mechanistic evidence → fuzzy claims

Few products have human-relevant ecosystem data, so brands rely on vague or risky microbiome claims.

Blunt tools for complex, keystone-driven ecosystems

Standard prebiotics/probiotics act broadly, rarely targeting defined keystone species networks.

High-value plant side-streams underused

Bioactive-rich fruit and plant waste mostly becomes low-value bulk, not validated microbiome actives.

Our Solution:

Precision Bioactive Ingredients That Reprogram the Gut

What we are:

- Precision molecules that **reprogram your own gut microbes**
- Proven in advanced human gut models and an ML/AI design loop
- A modular platform for cognition, immunity, healthy aging

What we are not:

- Not fiber/prebiotics blends
- Not probiotic supplements
- Not generic botanicals

Not Fiber. Not Probiotics. Precision bioactives that reprogram your gut ecosystem.

Where Trilliome Fits in the Microbiome Toolbox

Prebiotics | Probiotics | Postbiotics | **Precision Bioactives (Trilliome)**

OTHERS

- Classic prebiotics (fibers, HMOs)
- Probiotics & LBPs
- Postbiotics

TRILLIOME

Precision bioactive ingredients tuned to keystone species networks (human-model validated).

- Synergizes *with* fibers, probiotics, postbiotics
- **Designed as B2B ingredients** for supplements, functional foods, medical nutrition

Health Outcomes Are Driven by Keystone Species Networks

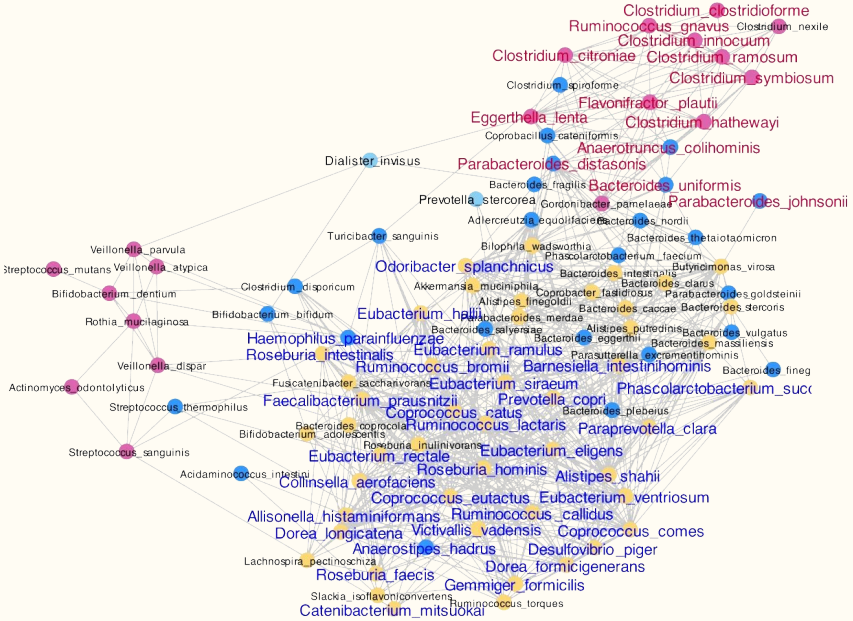


Image adapted from: Toward an improved definition of a healthy microbiome for healthy aging - Nature Aging 2022

Bifidobacteria, Agathobaculum, Coprococcus, Anaerostipes…
Methanobrevibacter, Alistipes..

Faecalibacterium, Akkermansia, Bifidobacterium…
Fusobacterium, Veillonella…

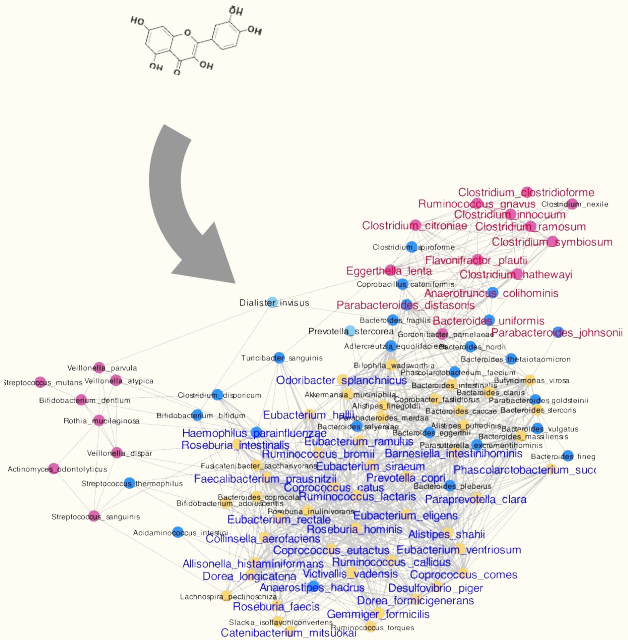
Prevotella, Lachnospiraceae, Lactobacillus…
Bacteroidetes, Escherichia-Shigella, Sutterella…

PCOS

Akkermansia, Ruminococcaceae, Bacteroidetes S24-7…
Bacteroides vulgatus, Firmicutes, Streptococcus…

From blunt tools to ecosystem engineering

Precision reprogramming of the gut microbiome

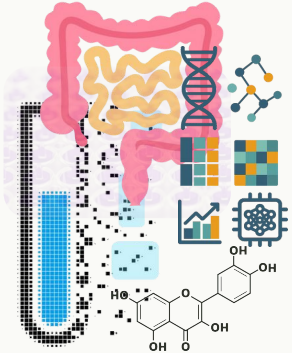


1. Direct Keystone Promotion
2. Trophic Network Enhancement
3. Niche Competition & Suppression
4. Host-Microbe Interaction Modulation
5. Quorum Sensing & Signal Interference
6. Postbiotic Precursor Delivery

The Trilliome Pipeline

AI Platform Turning Waste Streams into Targeted Gut Bioactives.

Source:
Fruits/Plant Waste Streams; Upcycled, renewable sources



Identify:
Compounds in Gut/Organoids & ML/AI Models

Validate:
Clinical Packages E.g. Gut Health, Cognitive/Mood, WH

Productize:
Validated Bioactives

B2B sales

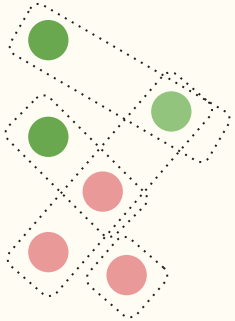
Ingredients
Supplements
Medical Foods

One Platform, Multiple Health Frontiers. Next:
Brain/Cognitive Health, Women's Health, Bone mineralization, Metabolic…

in vitro Models - Human data

Highly translatable models for discovery & development

novel bioactive candidates



existing/marketed bioactives

stool-based

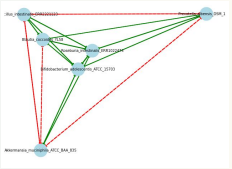
Organoid-based (can include stool microbiomes)

- S/BCFAs
- Bile acids
- Other metabolites
- Species / Pop Modulation
- gut hormones
- cytokines
- barrier functions
- Functional outcomes (e.g. anti-fibrotics)

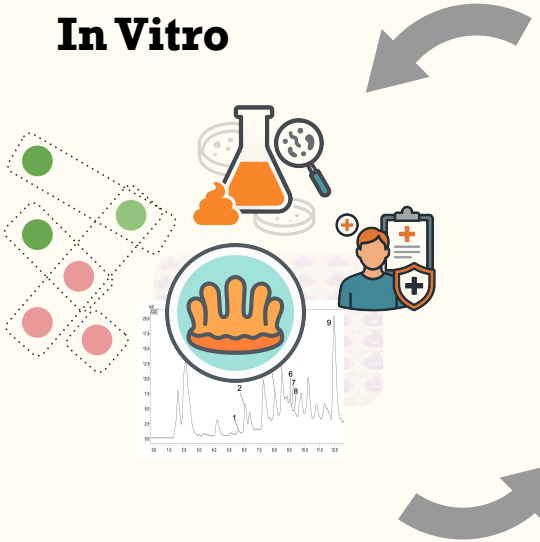
- Selective boost of target beneficial species and networks
- Suppression of undesirable / opportunistic species and networks
- Increased production of health-relevant metabolites (e.g. SCFAs)
- Improved host-relevant phenotypes (e.g. gut barrier integrity)
- Consistent effects across diverse human donors (low inter-individual variation)

In-silico modeling & closing the loop

Data-driven bioactive formulations development



In Vitro



S4 Optimization and Design Loop

S3 Causal Graph for Indirect Effects

S2 Community Dynamics

S1 Supervised response model

S0 Priors & Rules

In Silico

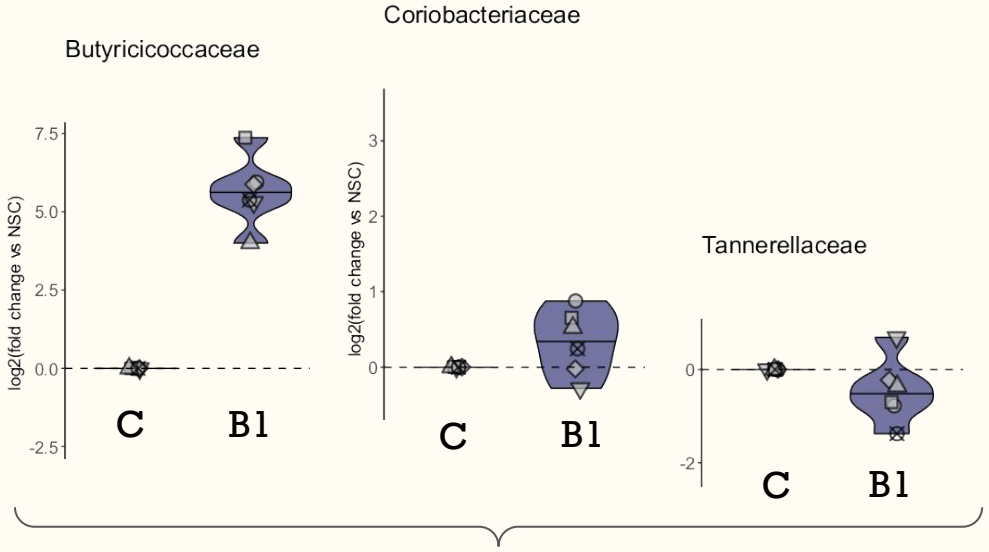
"Butyrate stimulates bone anabolism by expanding regulatory T cells in the bone marrow."

"*P. copri* induces Th2-type immune response elevating IL-13, stimulating hepatic IGF-1."

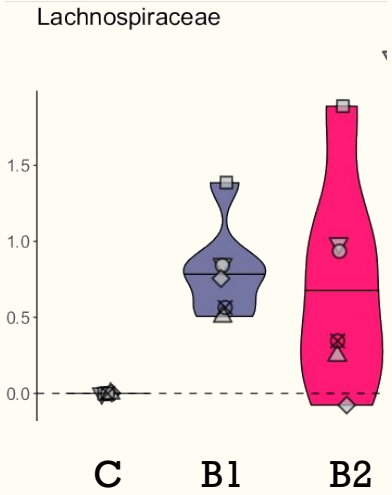
"Inulin-type fructan increased calcium absorption and increased whole-body BMC and BMD versus placebo."

Aiming for specificity & robustness

Identifying suitable bioactives



B1 works well to induce *Butyricicoccaceae*, and does not do much on *Coriobacteriacaea* or *Tannerellaceae*

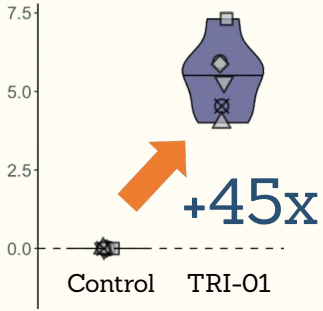


B1 induces a robustly *Lachnospiraceae* while B2 varies a lot depending on the recipient gut microbiome

Lead Product Performance

Boosting Keystone Network for Brain Health.

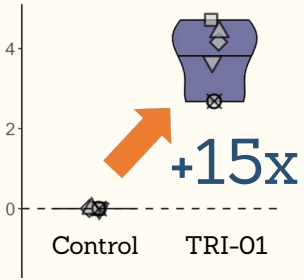
PATENT FILED



Neuroprotection

A. butyriciproducens

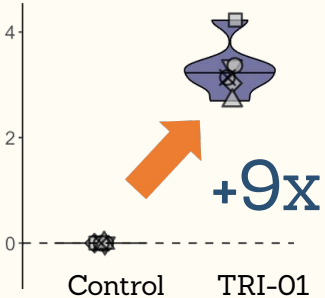
Protects brain cells & reduces oxidative stress



Mood & Well-being

C. catus

Produces dopamine, B vitamins, and propionate



Gut Barrier Integrity

A. hadrus

Strengthens gut lining & transforms harmful D-lactate to into butyrate

+150% SCFAs

- Butyrate, Propionate, Acetate
- Linked to improved cognitive function

+2x Resident Probiotics

- e.g. Bifido
- Supports gut barrier & overall health

All data shown from six donors / human stool models

Agathobaculum butyriciproducens

Neuroprotection and Cognitive Health

Specialized Butyrate Producer

Reduction of Oxidative Stress

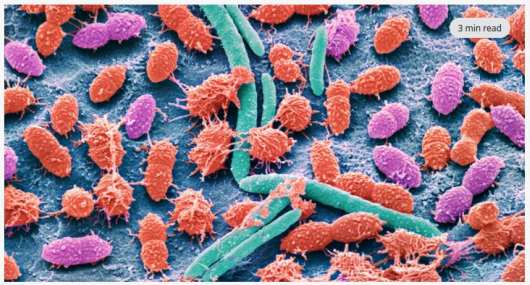
Agathobaculum butyriciproducens improves ageing-associated cognitive impairment in mice

Alterations in Gut Microbiota and Their Correlation with Brain Beta-Amyloid Burden Measured by ^{18}F-Florbetaben PET in Mild Cognitive Impairment Due to Alzheimer's Disease

Human gut microbiota Agathobaculum butyriciproducens improves cognitive impairment in LPS-induced and APP/PS1 mouse models of Alzheimer's disease.

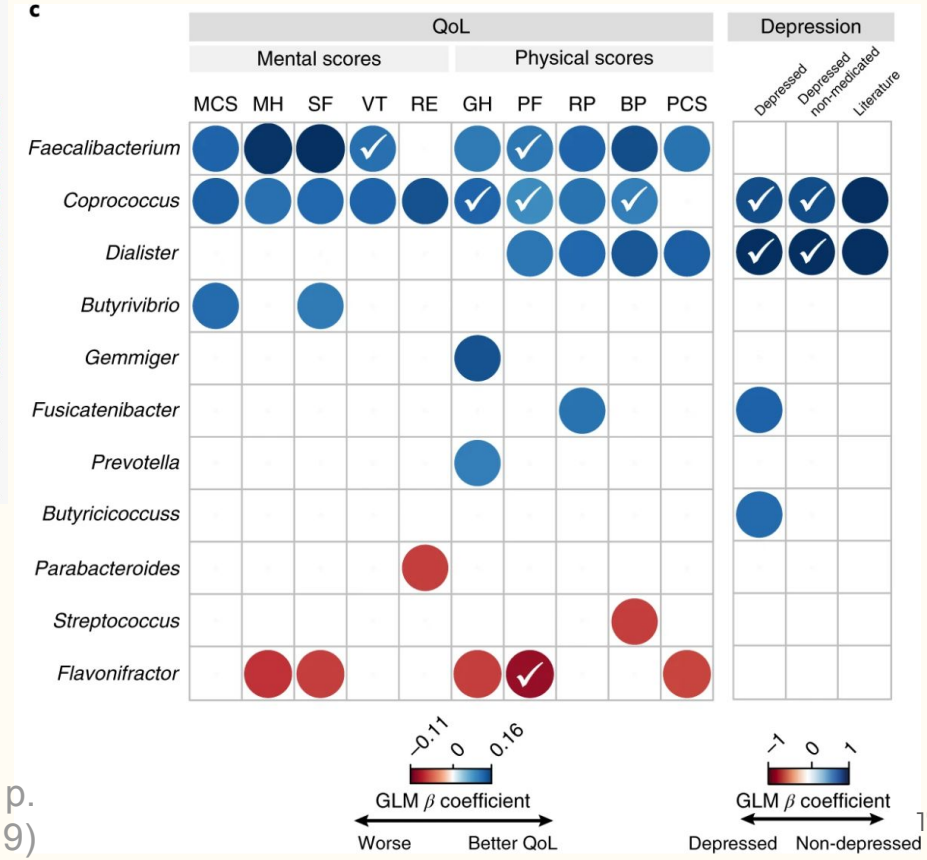
Coprococcus

Coprococcus in your gut: the secret of happiness?



Fleur Notting, Walter Pirovano, Wilbert Sybesma and Remco Kort
13 December 2023
Last update: 13/12/23 13:39

"Coprococcus bacteria were consistently associated with higher quality of life… [and] depleted in depression."



Nature Microbiology volume 4, p. 623–632 (2019)

Anaerostipes hadrus

- Involved in strengthening gut barrier
- Produces butyrate, propionate, and acetate
- Negatively correlated with Alzheimer's and Parkinson's disease
- Converts D-lactate (MASH, Metabolic dysfunction, inflammation) into highly beneficial butyrate

Article | Open access | Published: 19 March 2025

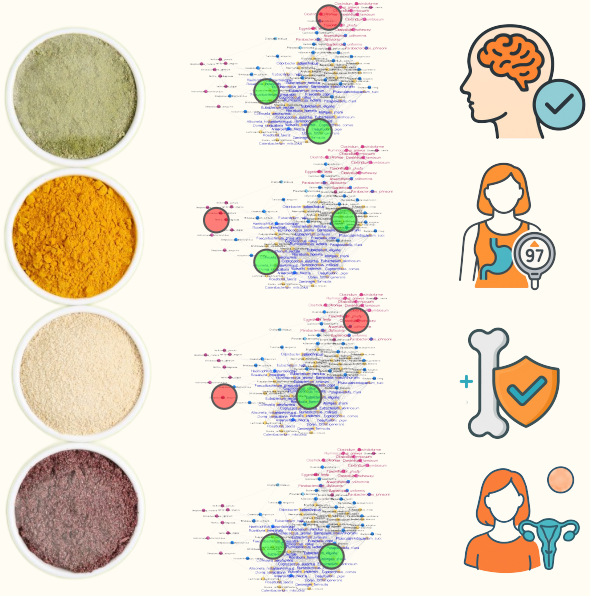
Comparative analysis of Parkinson's and inflammatory bowel disease gut microbiomes reveals shared butyrate-producing bacteria depletion

Maeve E. Krueger, Jake Sondag Boles, Zachary D. Simon, Stephan D. Alvarez, Nikolaus R. McFarland, Michael S. Okun, Ellen M. Zimmermann, Christopher E. Forsmark & Malú Gámez Tansey

npj Parkinson's Disease 11, Article number: 50 (2025) | Cite this article

The Vision: A New Pharmacopeia

One Platform, Many Health Frontiers



One Platform, Multiple Health Frontiers. Next:

Brain/Cognitive Health, Women's Health (many), Bone mineralization, Metabolic…

The Roadmap

Our Pipeline: A Modular 'Bioactives Library' for Health

Regulatory Readiness

Clinical Validations

Gut Health

Cognitive Health

Mood

Revenue Ramp & Global Expansion

Skin

Metabolic,

Womens Health →

H1 2026

Safety Complete

H2 2026

self-affirmed GRAS (US), FEHD (HK)

H1 2027

💊 *TX Spinoff (Neuroinflammation)*

H2 2027

FDA-notified GRAS (US)

H1 2028

MFDS (Korea)

H2 2028

JP, EU, CN →

The Team: Experience Across Leading Institutions

30+ years pioneering healthcare, microbiome science & biotech commercialization

Tim N Mak, PhD MBA
Co-founder | CBO

Patrick Guye, PhD MBA
Co-founder | CEO

Building Trilliome

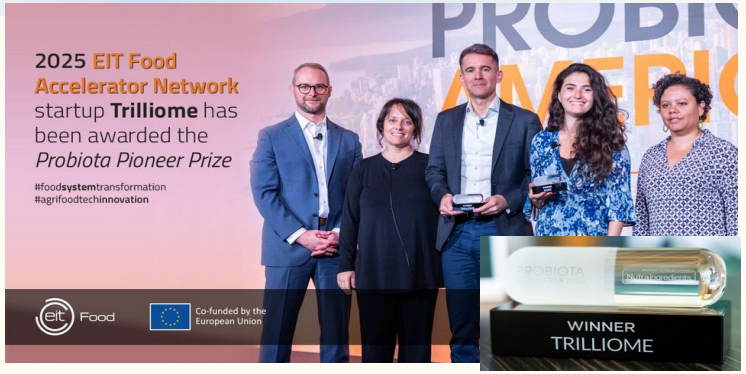
Bootstrapped & Supported
Venture Kick, EIT, Innosuisse & more

Strong Industry Engagement
5 industry partners (LOIs)

Strategic Academic Partnerships
Uni Basel, ETH BSSE

IP + Discovery Engine
Patent filed, ML engine running

Recognized & Winning
Three major 2025 awards so far in 2025



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ETH zürich
D-BSSE
Department of Biosystems Science and Engineering

Superlab Suisse

Bluelion

From Gut Health to Ecosystem Engineering

Building the New Pharmacopeia for Healthspan

hello@trilliome.com

What we are doing

Reprogramming **keystone species networks** with precision bioactives

Turning **upcycled plant side-streams** into defined microbiome modulators

Linking **human ex vivo gut models + in silico** to brain & healthy-aging outcomes

Where we are heading

A **modular library** of microbiome-targeting bioactives for cognition, resilience & healthy aging

Shared **frameworks for network-based product design** (beyond single strains/fibers)

A path from **ingredients today** to future **healthspan-focused therapeutics**

How to collaborate with us

Co-develop **gut–brain, women's health and other healthy-aging formulations**

Run your concepts through our **human gut models & data pipeline**

Explore **research and clinical partnerships** around ecosystem & keystone networks