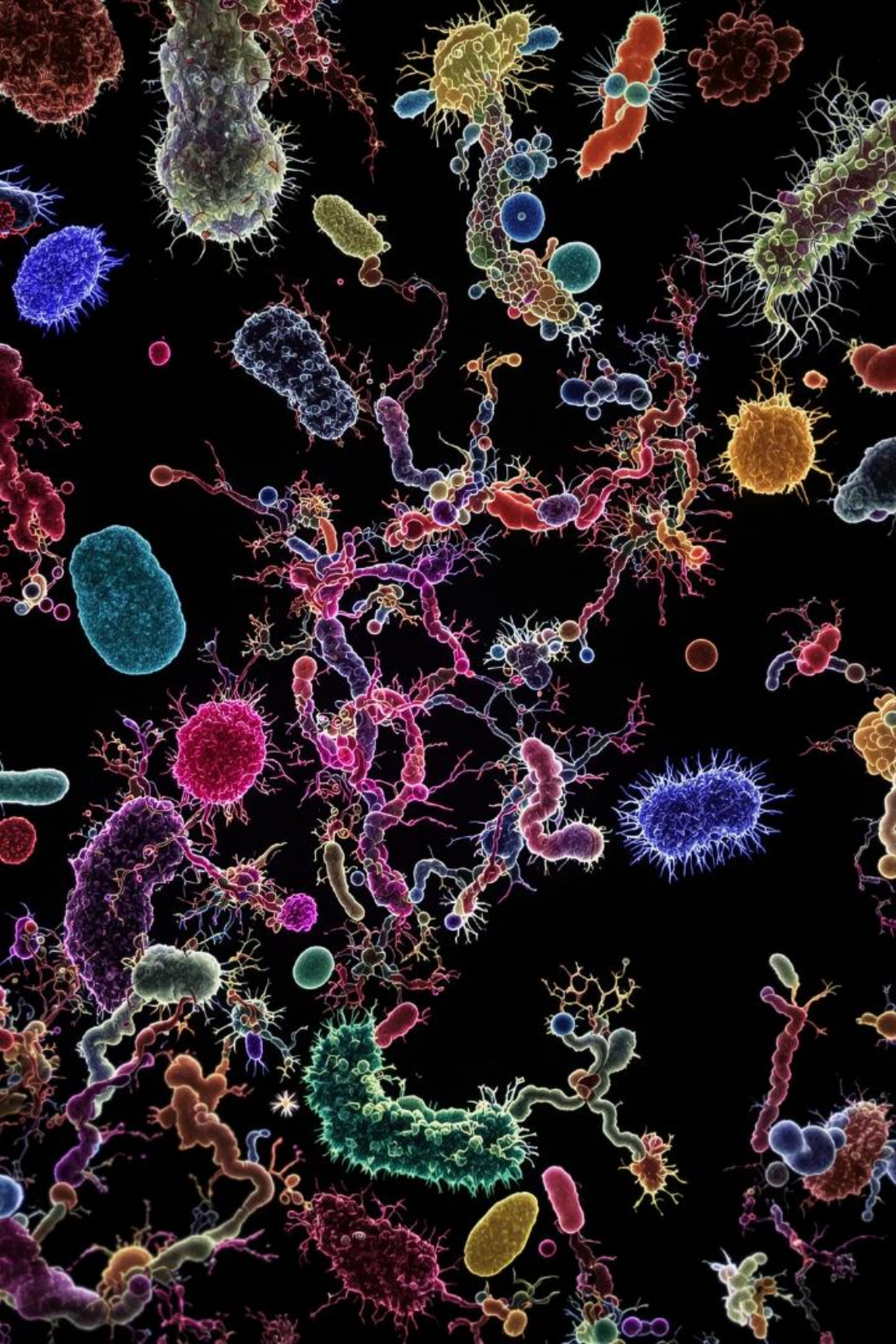


The Power of Biotics: Probiotics, Prebiotics, and Postbiotics

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University of Medical Sciences, Mashhad, Iran





Biotics play a vital role in our health. They interact with our gut microbiome, immune system, and overall wellbeing.

This presentation explores the world of probiotics, prebiotics, and postbiotics - their differences, benefits, and growing market applications.

Understanding Biotics



Probiotics

Live microorganisms that provide health benefits when consumed in adequate amounts.



Prebiotics

Non-digestible food ingredients that feed beneficial gut bacteria.



Postbiotics

Bioactive compounds produced by microorganisms during fermentation or from dead microbes.



Probiotics: Living Microorganisms with Health Benefits



Key Bacterial Species

Bifidobacterium and **Lactobacillus** genera are the most frequently studied probiotic species.



Protection Functions

Probiotics protect against pathogens and help normalize disturbed microbiota.



Immune Benefits

They stimulate immune function and can reduce allergy risk.



Clinical Applications

Effective for preventing/improving diarrhea and protecting against necrotizing enterocolitis (NEC).

Probiotics: Live Beneficial Microorganisms

What Are They?

Live microorganisms that confer health benefits when consumed in adequate amounts.

Typically include lactic acid bacteria and bifidobacteria.

Key Benefits

- Improve gut microbiota diversity
- Enhance immune function
- Prevent gut dysbiosis
- Help manage IBS and IBD
- Support mental health

Prebiotics: Food for Good Bacteria

Definition

Non-digestible food ingredients, typically fibers like oligosaccharides, that support the growth of beneficial microbes in the gut.

Sources

Found in foods like garlic, onions, bananas, asparagus, and whole grains.

Function

Serve as food for probiotics, helping them thrive and maintain gut health.



Prebiotic Health Benefits

Microbiota Diversity

Promotes a diverse and balanced gut microbiome.



SCFA Production

Supports production of short-chain fatty acids crucial for gut health.



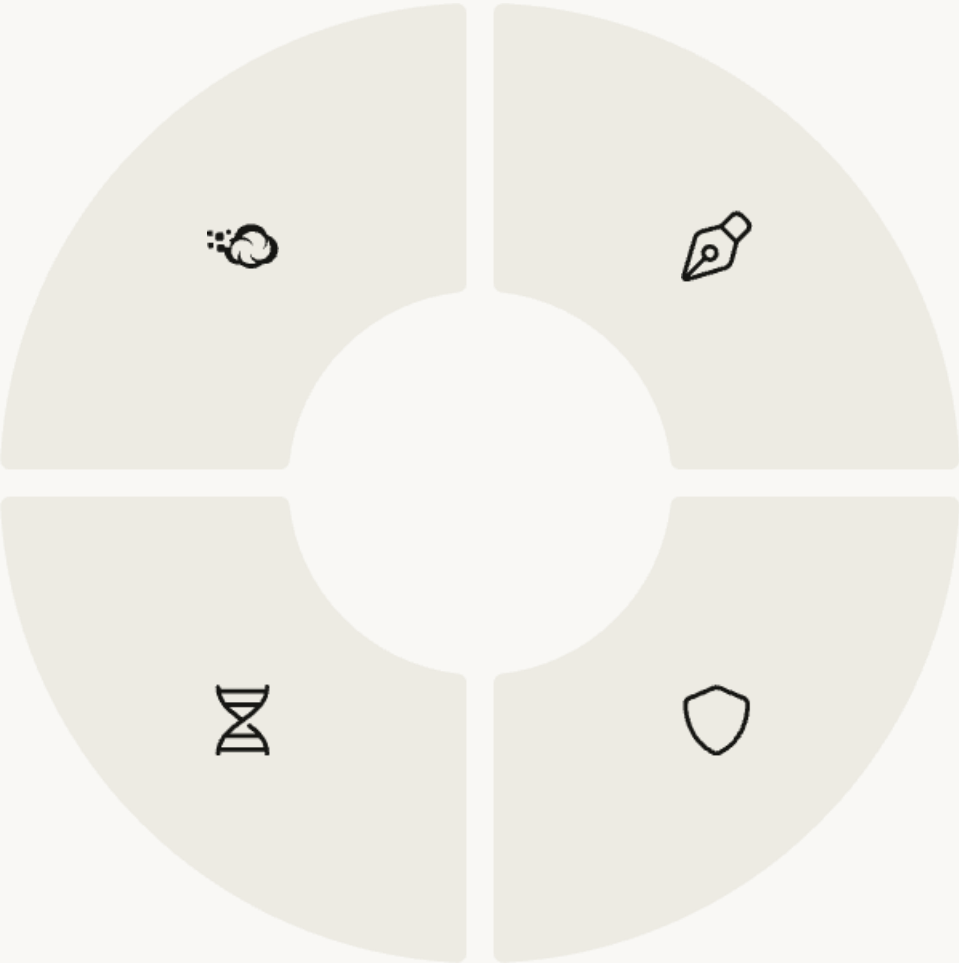
Nutrient Absorption

Enhances absorption of minerals like calcium.



Intestinal Barrier

Improves function of the intestinal barrier.



Prebiotics: Selectively Utilized Substrates

Common Oligosaccharides

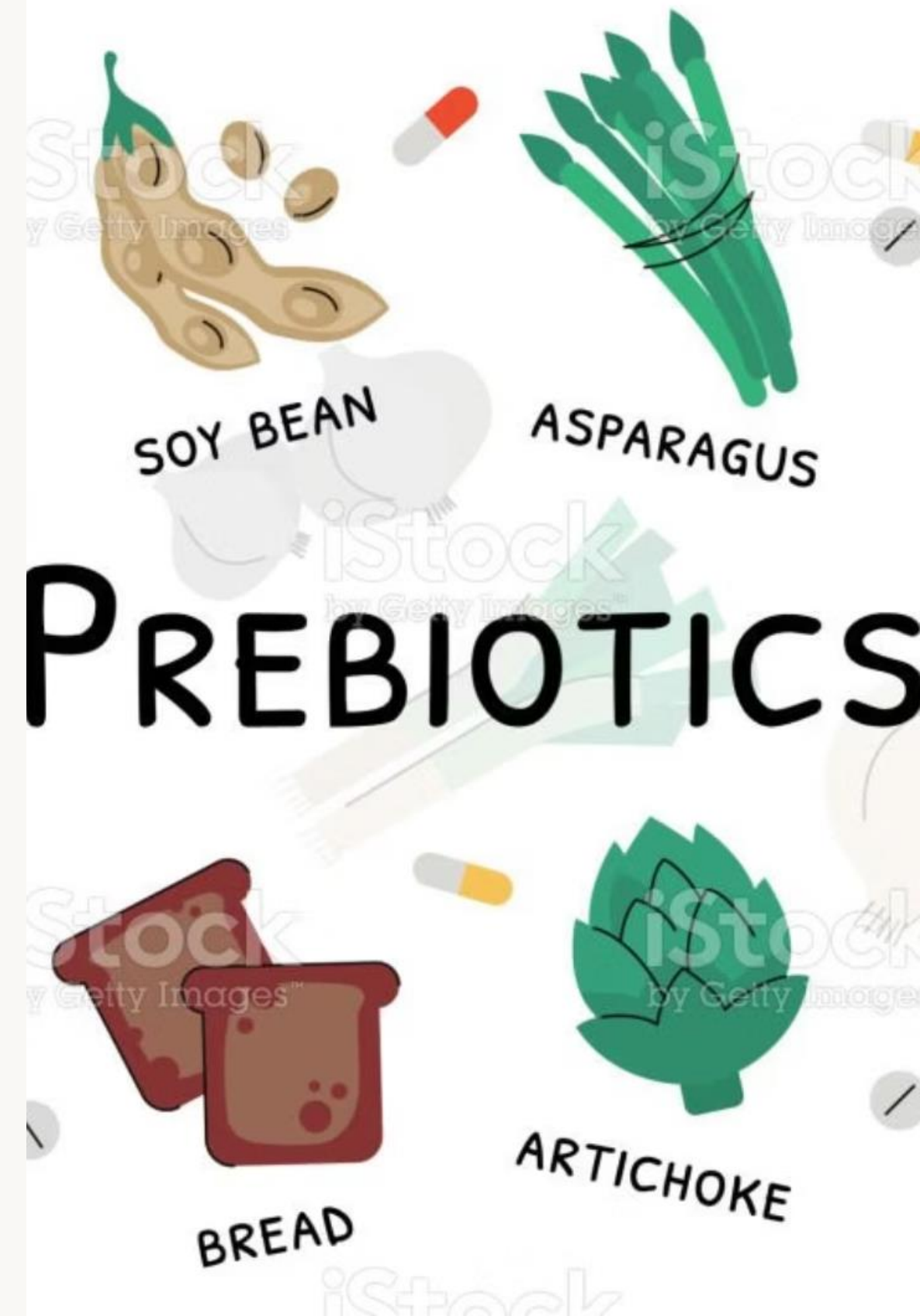
Galacto-oligosaccharides (GOS) and fructo-oligosaccharides (FOS) are the most frequently used and well-studied prebiotics.

Additional Options

Inulin and polydextrose are other potential prebiotic substrates that can support beneficial gut microorganisms.

Human Milk Oligosaccharides

Newer prebiotics include 2'-fucosyllactose (2'-FL) and lacto-N-neotetraose (LNnT), two of the most abundant HMOs in human milk.



Beyond Live Bacteria: The Emerging Postbiotic Concept

Traditional Focus

The primary emphasis has traditionally been on live beneficial bacteria (probiotics) for health promotion.

Shifting Perspective

Emerging evidence suggests probiotic benefits may not require viable microbes.

Metabolite Impact

A significant portion of therapeutic effects may come from bacterial metabolites—postbiotics.



Postbiotics: The New Frontier



Fermentation

Microorganisms produce bioactive compounds during fermentation.



Microbial Byproducts

Byproducts of dead microorganisms contain beneficial compounds.



Health Benefits

Confer benefits without requiring live bacteria.

Understanding Postbiotics: Microbial Factories



Microbial Factory

Bacteria act as factories to enrich food matrices with beneficial compounds.



Fermentation Process

Metabolites are produced through fermentation facilitated by bacterial activity.



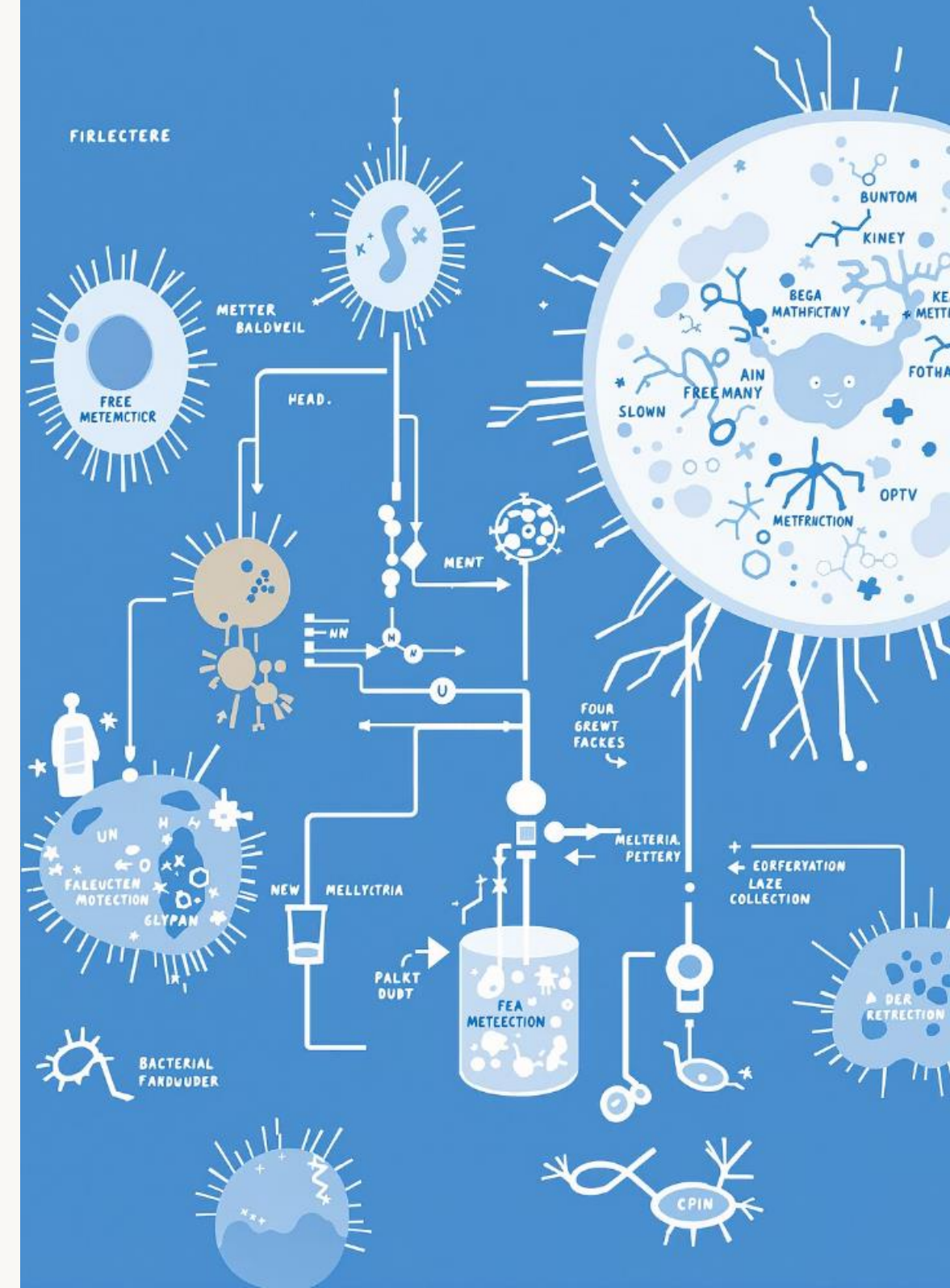
Bioactive Compounds

Non-viable bacteria and their metabolites possess bioactive properties.



Health Benefits

These compounds confer health benefits without requiring bacterial viability.



Postbiotics: Official Definition



Complete Definition

"A preparation of inanimate microorganisms and/or their components that confers a health benefit on the host."



Preparation

Recognizes that specific formulation, including microbial biomass and inactivation methods, affects benefits.



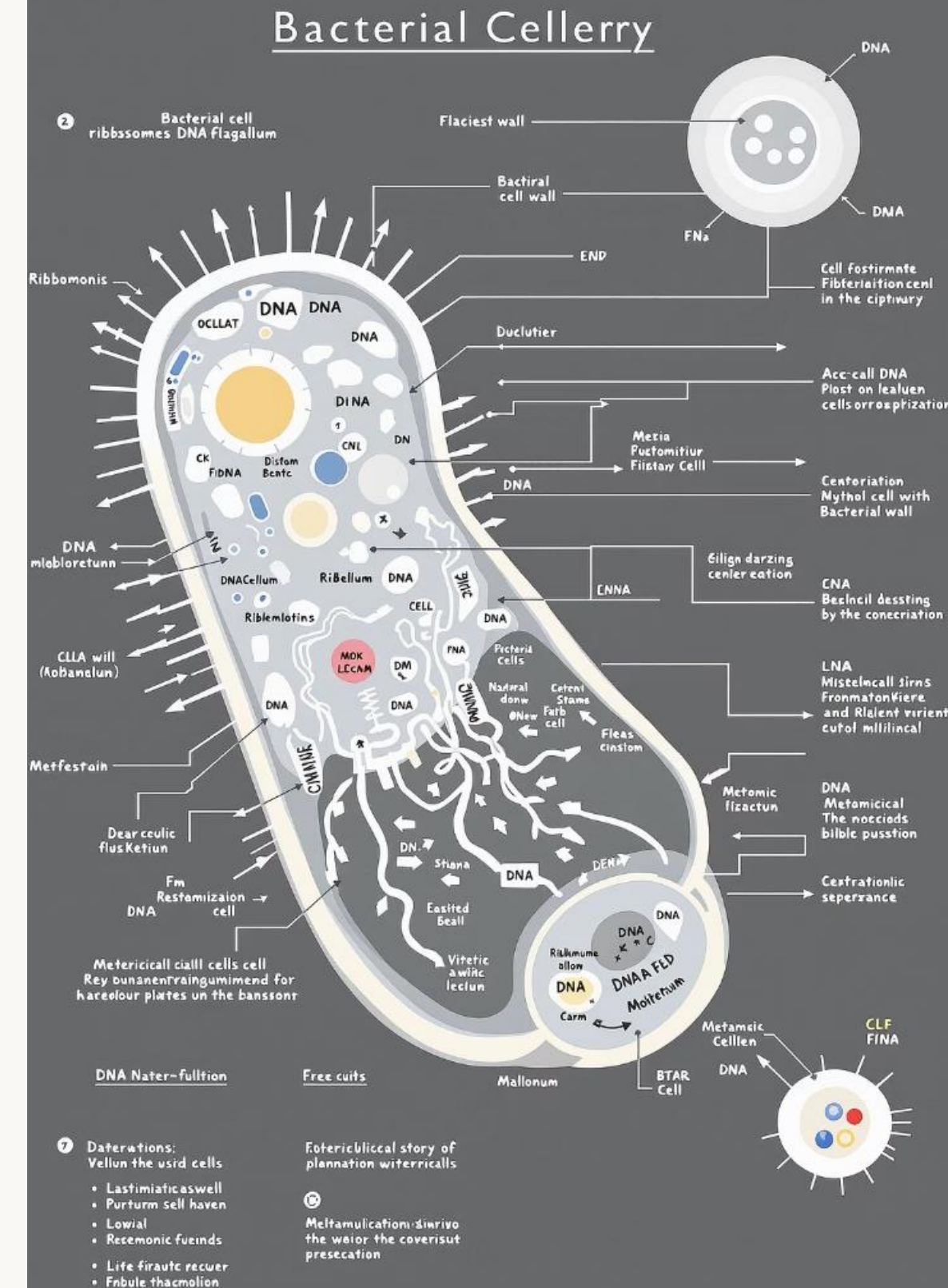
Inanimate

Acknowledges these materials aren't merely "dead" or "inactive" but remain biologically active.

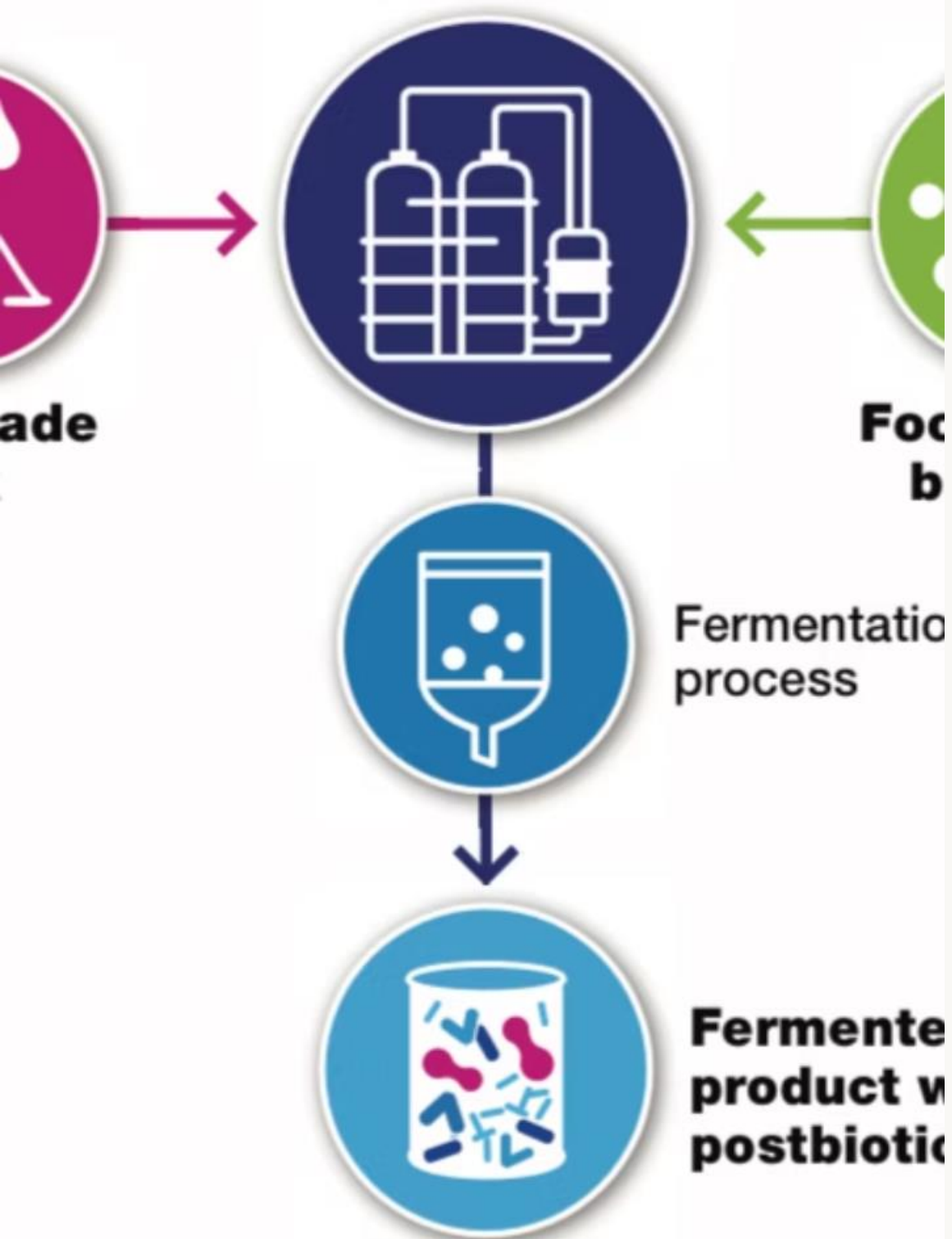


Components

Health effects may be mediated by different cell parts or metabolites.



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Postbiotic Components: Products of Fermentation



Organic Acids

Primary metabolites
produced during bacterial
fermentation



Proteins & Peptides

Bioactive compounds with
diverse functional
properties



Vitamins

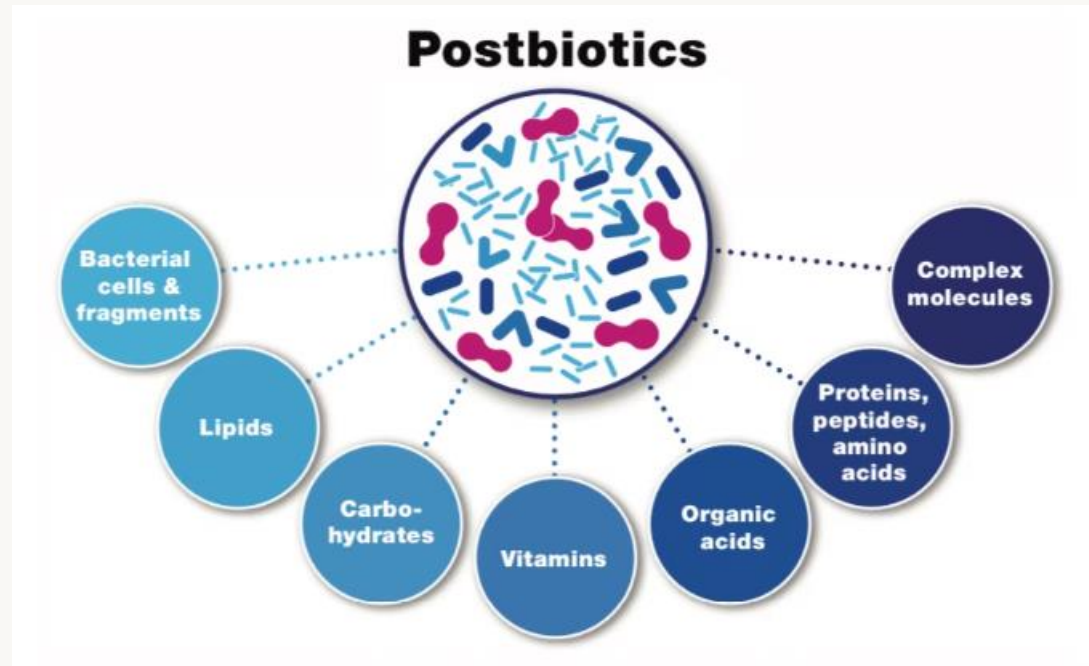
Essential micronutrients
synthesized during
fermentation



Cell Wall Components

Structural elements that
interact with host systems

Strain Selection and Fermentation Conditions



Bacterial Strain Selection

The right strains are crucial as bioactive metabolite production is strain-dependent



Optimal Conditions

Temperature, pH, and substrate affect metabolite production



Food Matrix Influence

Interacts with bacteria to determine final postbiotic composition

Key Components of Postbiotics



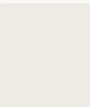
Short-Chain Fatty Acids (SCFAs)

Acetate, propionate, and butyrate produced during fiber fermentation.



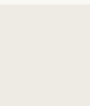
Bacteriocins

Antimicrobial peptides that inhibit harmful bacteria growth.



Lipopolysaccharides

Cell wall components that interact with the immune system.



Peptides

Bioactive protein fragments with various health benefits.



Short-Chain Fatty Acids: Postbiotic Powerhouses

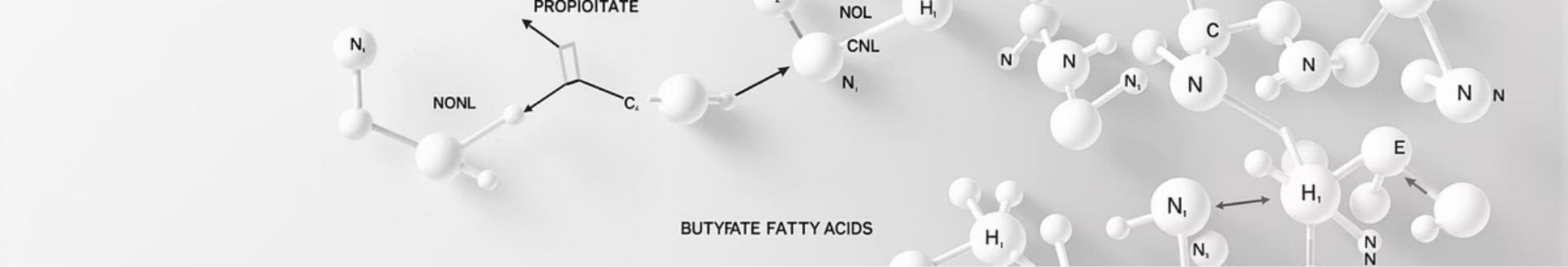
Energy Source
Fuel colon cells and provide energy
for gut function.

Inflammation Reduction
Reduce inflammatory responses in
the gut and beyond.



Metabolic Regulation
Help regulate metabolism
throughout the body.

Gut Barrier Integrity
Promote tight junctions between
intestinal cells.



Short-Chain Fatty Acids: Essential Postbiotics

Production

Formed when gut bacteria ferment plant fibers and undigested carbohydrates.

Functions

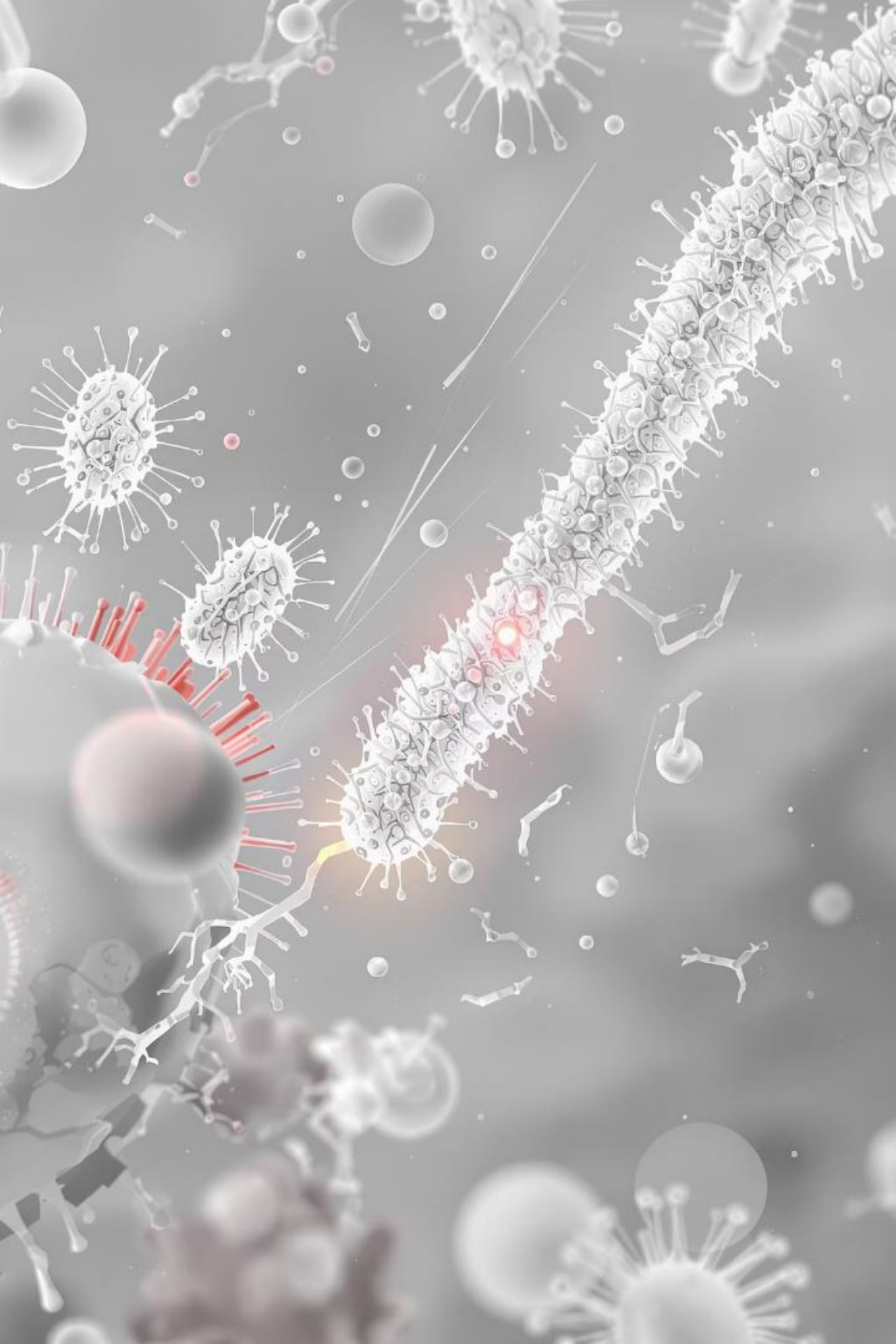
Provide energy to gut cells, support metabolism, and regulate cholesterol levels.

Proportions

Acetate, propionate, and butyrate exist in approximate 60:20:20 ratio in the colon.

Bacterial Sources

Lactobacillus and Limosilactobacillus species produce SCFAs through fermentation.



Peptides and Proteins: Antimicrobial Components

Diverse Peptide Production

Bacteria generate a wide array of peptides with important biological functions.

Antimicrobial Activity

These peptides exhibit strong antimicrobial properties through multiple mechanisms.

Classification System

Can be categorized as ribosomal (bacteriocins) or non-ribosomal peptides.

Surface Proteins: Critical Probiotic Components

Structural Variety

Surface proteins include lipoproteins and sortase-anchored proteins on bacterial membranes.

- Anti-inflammatory properties
- Anti-adhesion capabilities

Protective Functions

These proteins enhance epithelial barriers and bind heavy metals in the gut.

- Reduce pathogen-induced apoptosis
- Inhibit caspase-3 activation

Bacterial Examples

Different bacteria produce unique bioactive peptides with specific functions.

- *Bacillus subtilis* peptides
- Bacteriocins from various species

Postbiotic Peptides and Enzymes

Bacteriocins

Antimicrobial peptides that inhibit harmful bacteria growth.

- Target specific pathogens
- Preserve gut microbiome balance
- Natural alternatives to antibiotics

Digestive Enzymes

Support breakdown of nutrients for improved digestion.

- Lactase breaks down lactose
- Protease helps digest proteins
- Enhance nutrient absorption

Antimicrobial Mechanisms of Bacterial Peptides

1

Membrane Acidification

Peptides alter bacterial membrane pH creating inhospitable conditions

2

Pore Formation

Creates openings in cell membranes causing cytoplasmic leakage

3

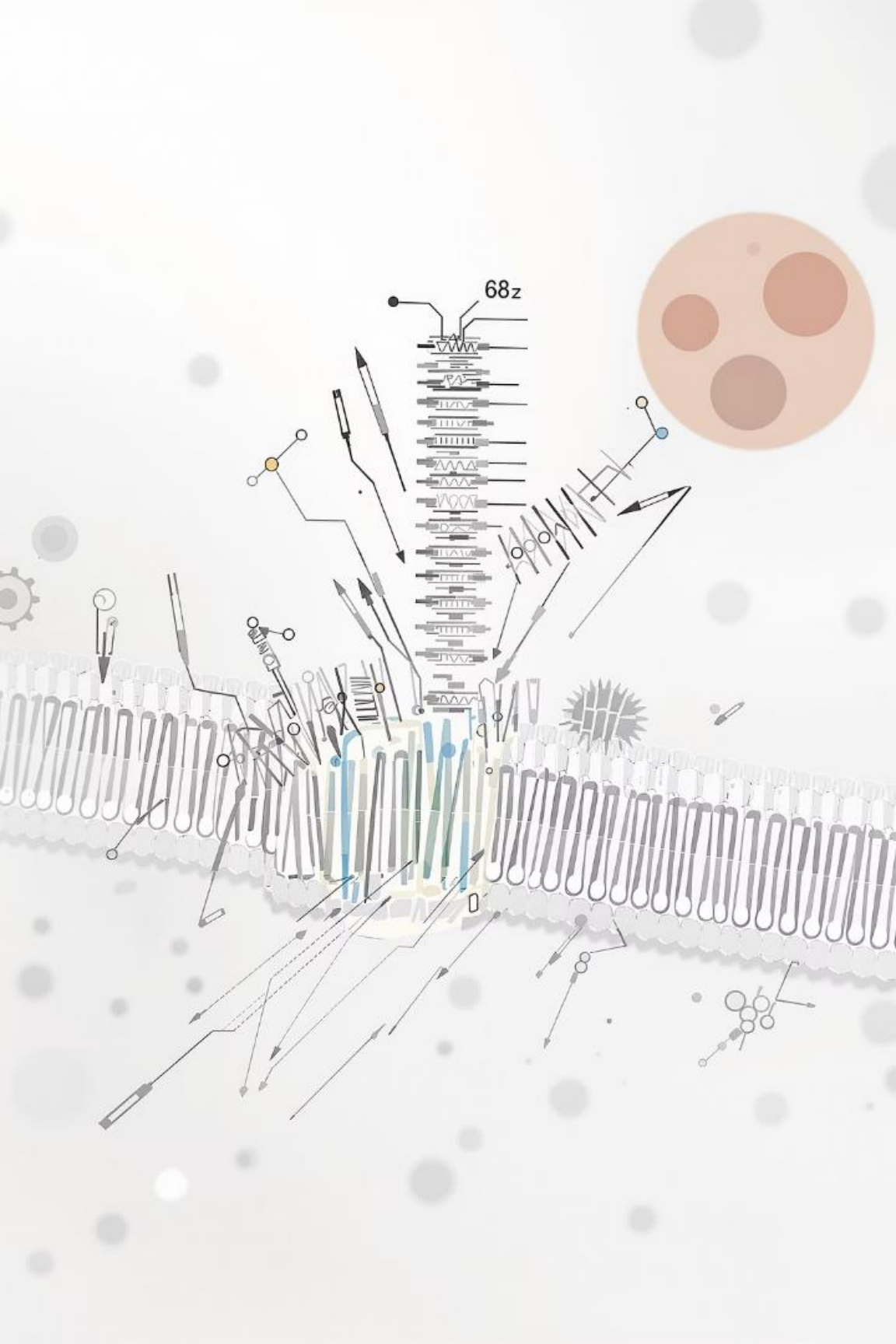
Lethal Processes

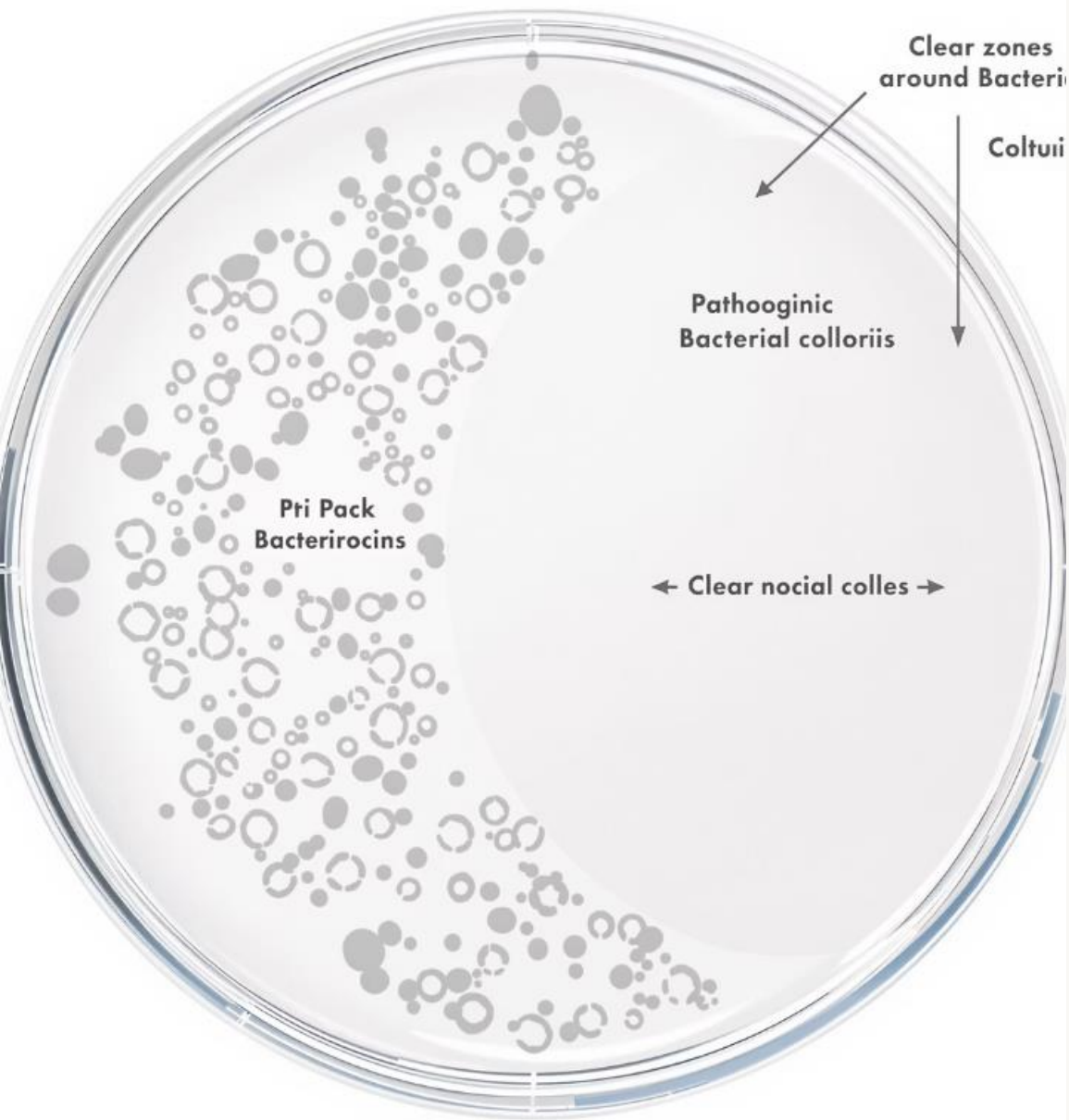
Triggers destructive cellular activities like hydrolase activation

4

Internal Disruption

Damages critical internal bacterial components





Bacteriocins: Ancient Antimicrobial Compounds

Historical Use

Used for millennia in food fermentation due to potent antibacterial effects.

Classification

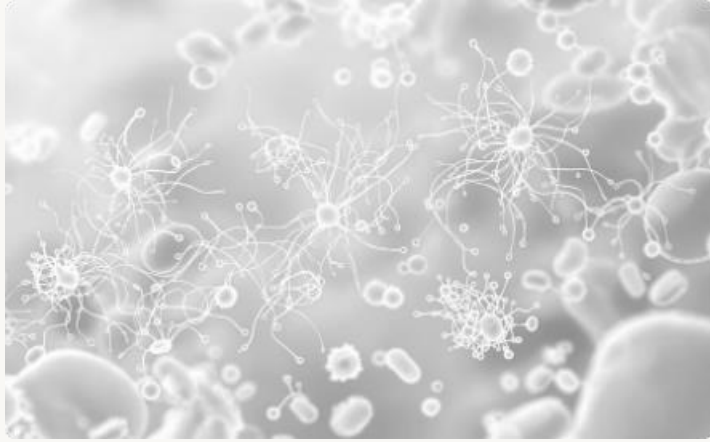
Categorized by size, mechanism of action, and target spectrum.

Key Properties

Inhibit gastrointestinal pathogens and remain stable under varying conditions.

Offer the inhibition inhibition zones from natural sieficial zones, against the lactation clear zones and around the pathogenic bacteria, emulating the clear zones around the initial colonies.

Bacteriocins: Anti-Biofilm Mechanisms



Motility Inhibition

Disrupts biofilm formation by targeting pili-mediated twitching and flagella-driven movement.




Quorum Sensing Interference

Blocks bacterial cell-to-cell communication, reducing colonization and virulence factors.



Virulence Suppression

Neutralizes compounds like pyocyanin that promote biofilm formation.



Killed Microbial Cells: Safe Postbiotics

Heat-Killed Probiotics

Provide benefits without the need for live bacteria, offering stability and safety advantages.

Immune Modulation

Cell wall components stimulate immune responses even when the bacteria are no longer viable.

Safety Profile

Eliminate concerns about bacterial overgrowth or translocation in vulnerable individuals.



Exopolysaccharides: Bacterial Polymers

1

Structural Composition

High-molecular-weight polymers secreted by various bacteria.



Bacterial Sources

Produced by lactic acid bacteria including Lactococcus and Bifidobacterium.



Food Applications

Widely used in dairy and fermented foods to enhance texture and shelf life.



Health Benefits

Exhibit various bioactive properties that support human health.

Health Benefits of Exopolysaccharides



Cardiovascular Protection

Kefiran (from *L. kefirifaciens*) delays atherosclerosis and improves cholesterol metabolism.



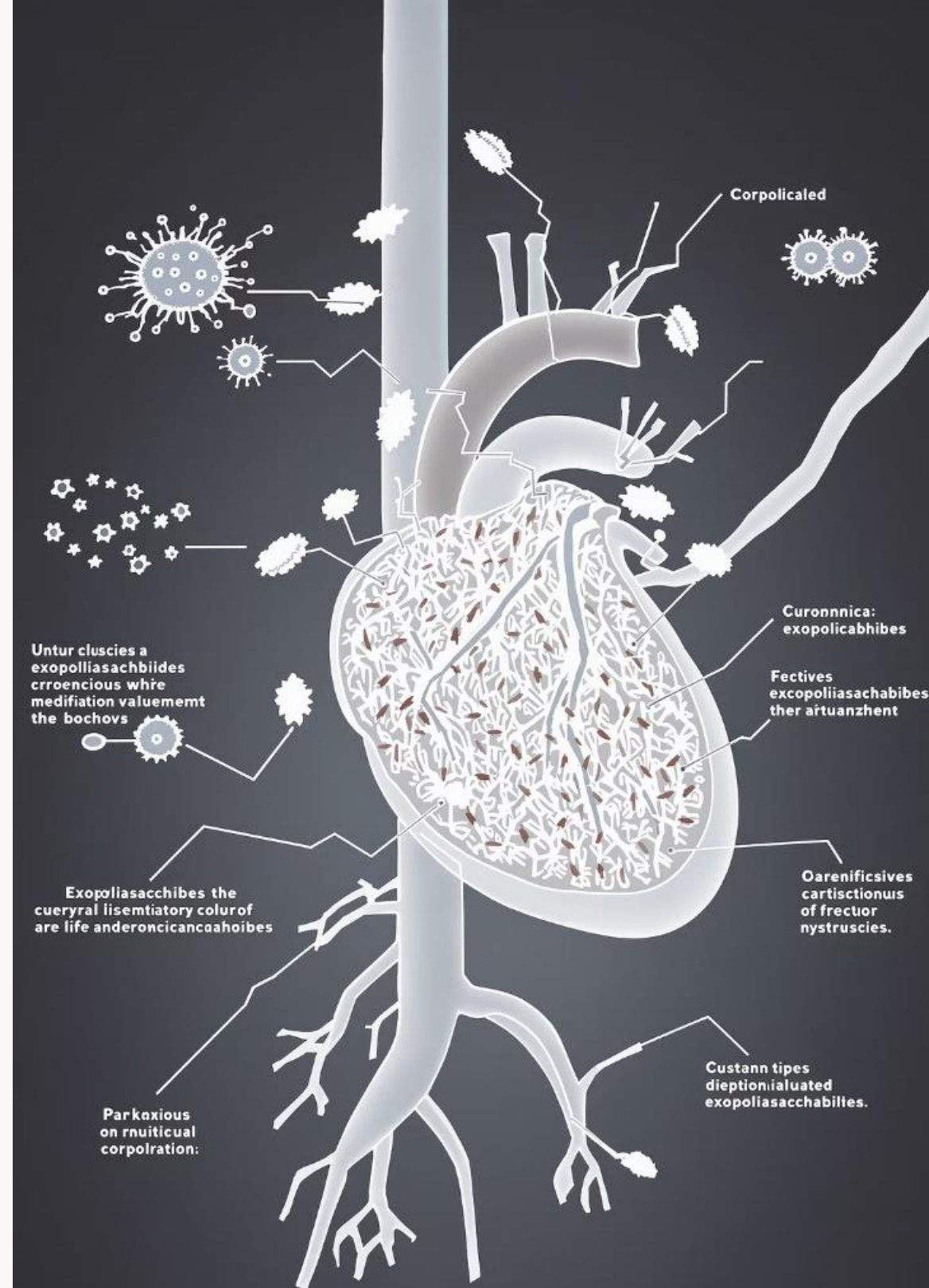
Metabolic Effects

EPS may reduce cholesterol absorption and improve carotenoid bioavailability.

2

Immunomodulation

β -glucans bind to Dectin-1 receptors on macrophages, enhancing immune responses.





Functional Food & Pharmaceutical Applications of EPS



Antioxidant Properties

EPS from Lactobacillus strains exhibit potent antioxidant activity.



Antimicrobial Functions

Provide natural preservation in food systems.



Industrial Uses
Employed for water retention, emulsification, and stabilization.



Pharmaceutical Potential
Growing applications in drug delivery systems.

Future Research Directions for EPS

Safety Research

Further studies needed on long-term safety and efficacy of EPS applications.

- Toxicity assessments
- Allergenicity profiles
- Dosage optimization

Delivery Systems

Optimization for pharmaceutical and functional food applications.

- Encapsulation techniques
- Stability enhancement
- Targeted delivery

Immune Modulation

Deeper understanding of mechanisms behind immune system effects.

- Receptor interactions
- Signaling pathways
- Clinical applications

Organic Acids: Potent Antimicrobial Postbiotics



pH Modification

Lower environmental pH creates unfavorable conditions for acid-sensitive bacteria



Energy Depletion

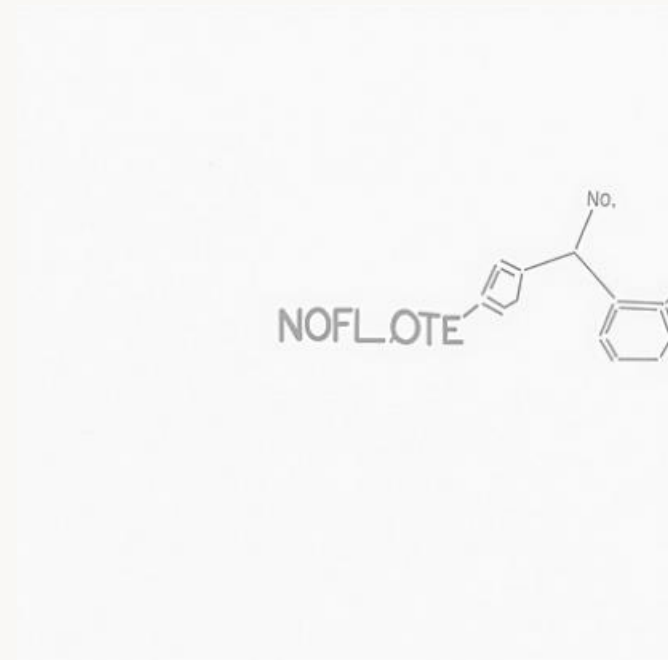
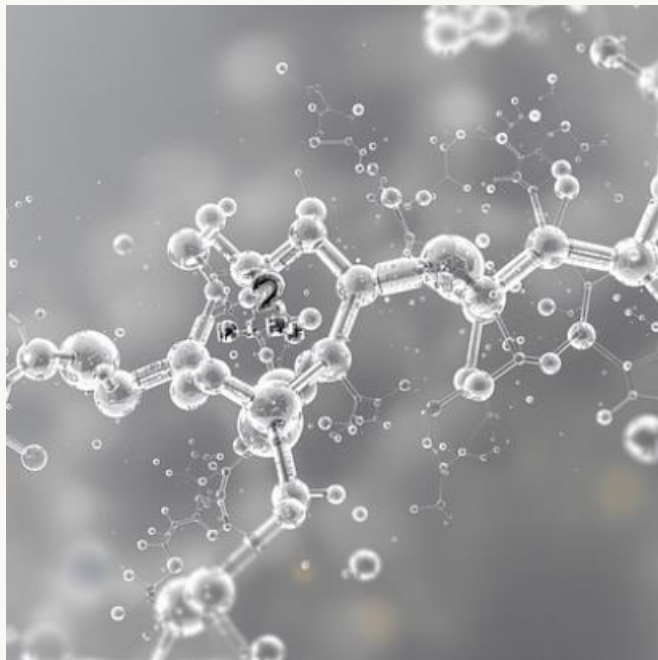
Force bacterial cells to expend energy expelling excess protons



Growth Inhibition

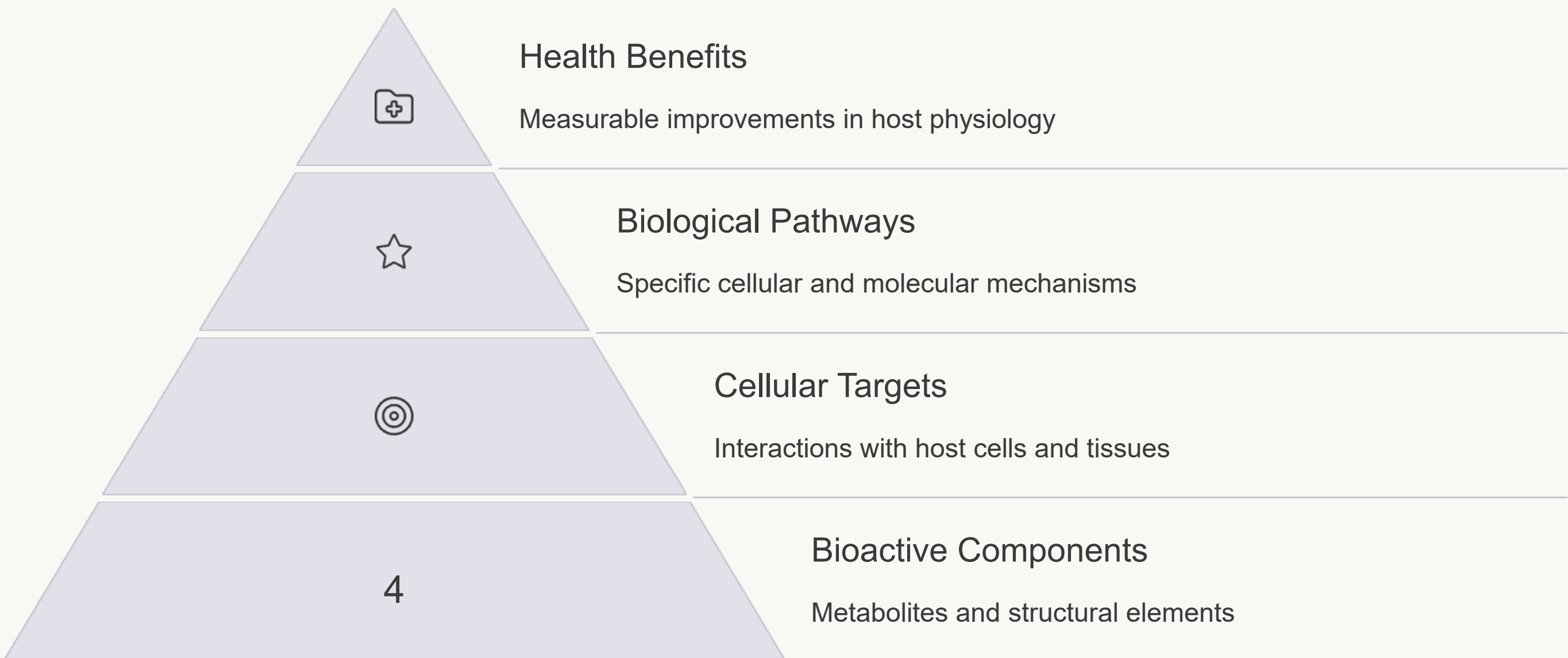
High concentrations block spoilage microbes and pathogens

Vitamins as Essential Postbiotic Metabolites

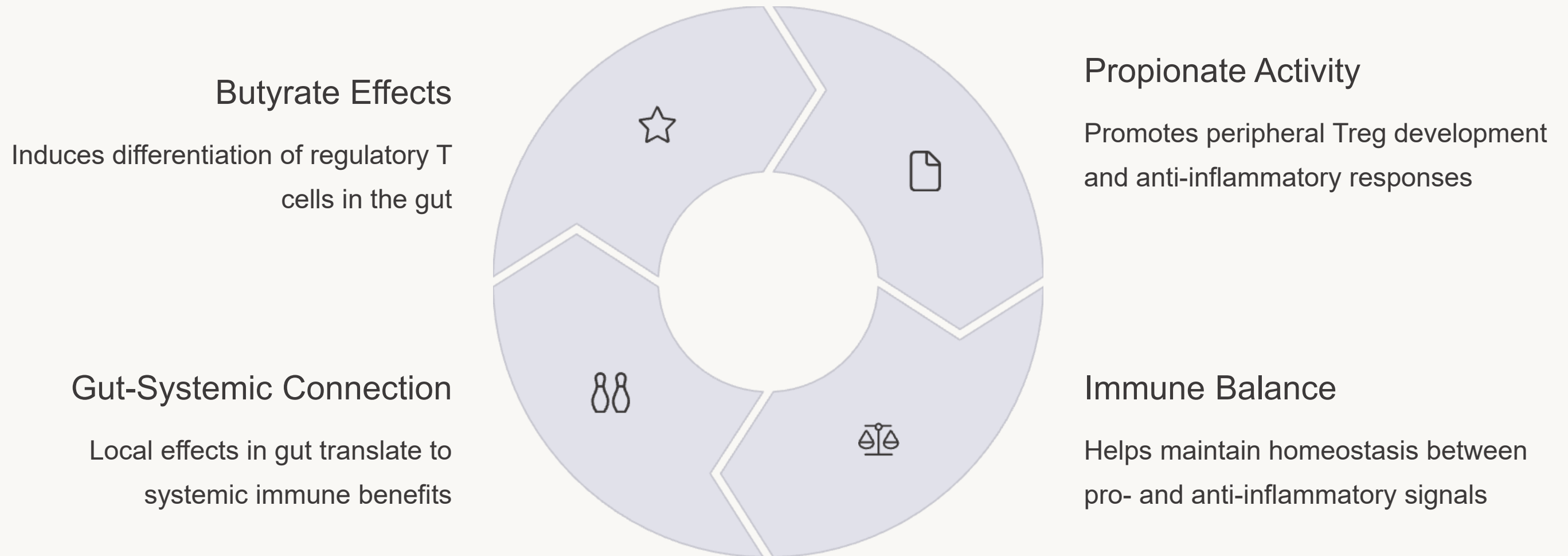


Vitamins are critical organic compounds needed in small quantities for essential biological processes. Most cannot be synthesized by humans, requiring dietary intake or gut microbiota production.

Mechanisms of Action: How Postbiotics Work



Immunomodulation: SCFA-Mediated Effects



Immunomodulation: Postbiotic Activity Mechanisms

Bacillus coagulans Effects

Cell wall fragments and supernatant reduce inflammation by stimulating anti-inflammatory cytokines like IL-10.

Immune Pathway Shifts

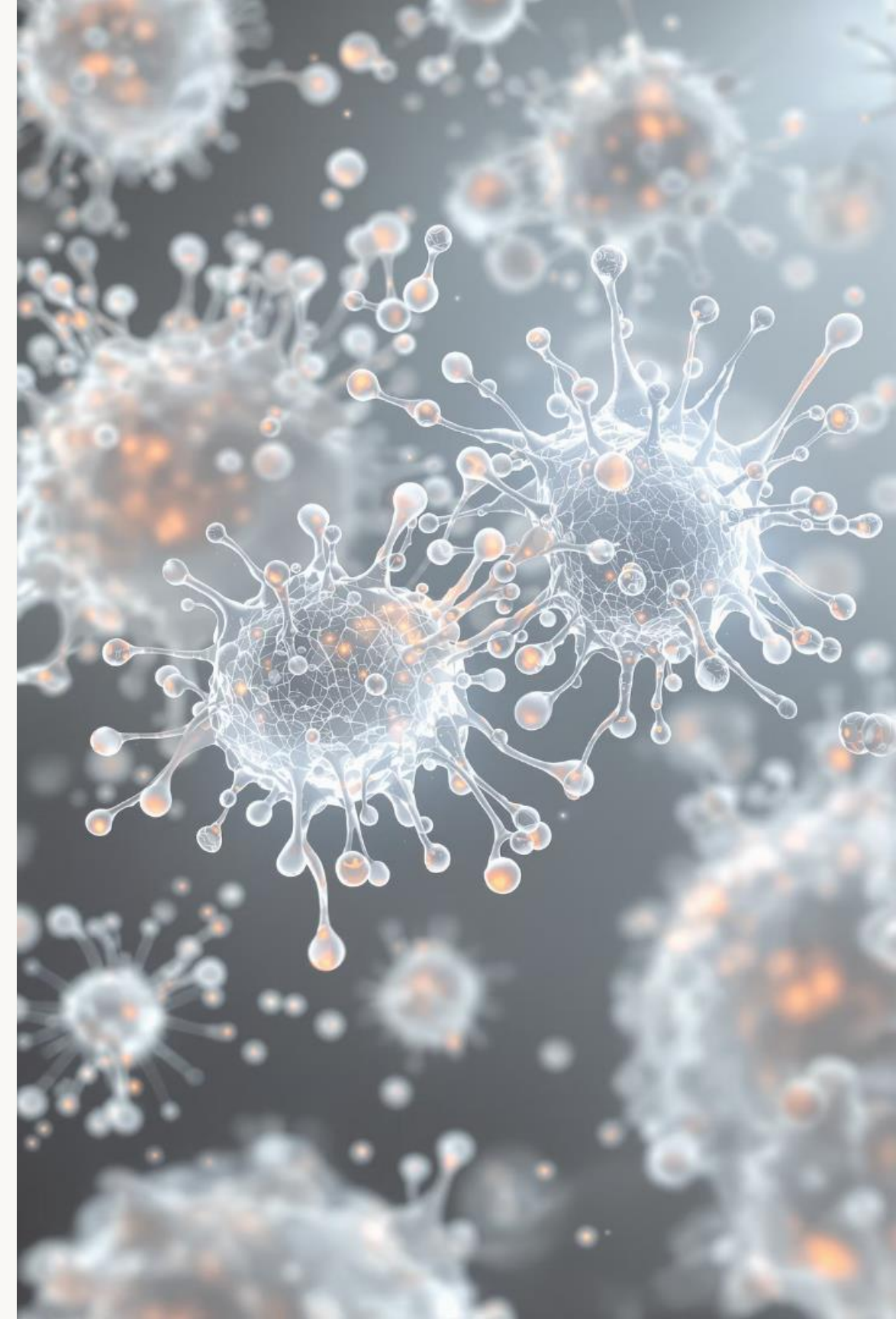
Promote Th2 immune responses while suppressing Th1 pathways linked to allergic disorders.

Dendritic Cell Maturation

Bifidobacterium breve supernatant enhances dendritic cell maturation, increasing IL-10 production.

Inflammatory Cytokine Reduction

Postbiotics reduce proinflammatory TNF- α levels in various tissues.

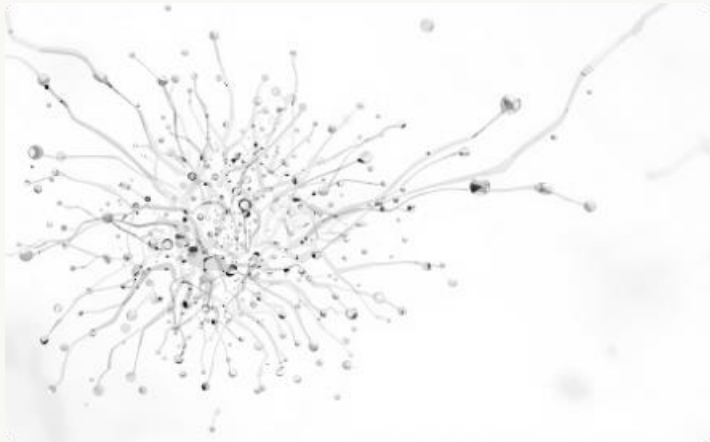


Postbiotic Cellular Targets in Immune Modulation



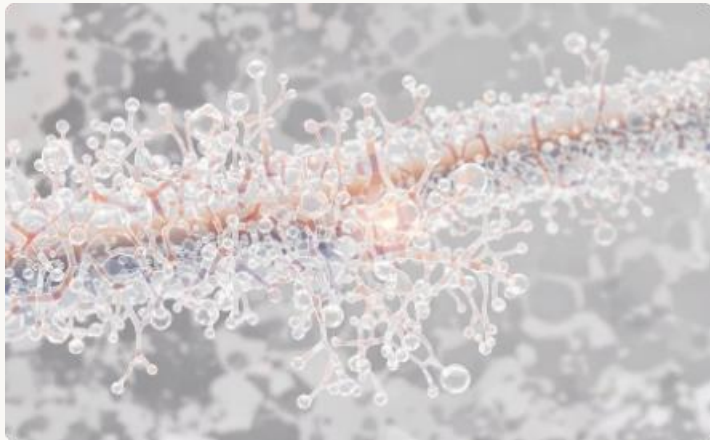
T Cell Regulation

Postbiotics target CD8+ T cells and modulate IFN- γ production to balance immune responses.



Phagocytic Activity

Enhanced macrophage function improves pathogen clearance while controlling inflammation.



Receptor Activation

Microbial components like lipoteichoic acid and peptidoglycan activate specific immune receptors.

Immune Modulation Pathways of Postbiotics

↓ 33%

TNF- α Reduction

Postbiotics lower pro-inflammatory cytokine production

↑42%

IL-10 Increase

Enhanced anti-inflammatory cytokine production

↑27%

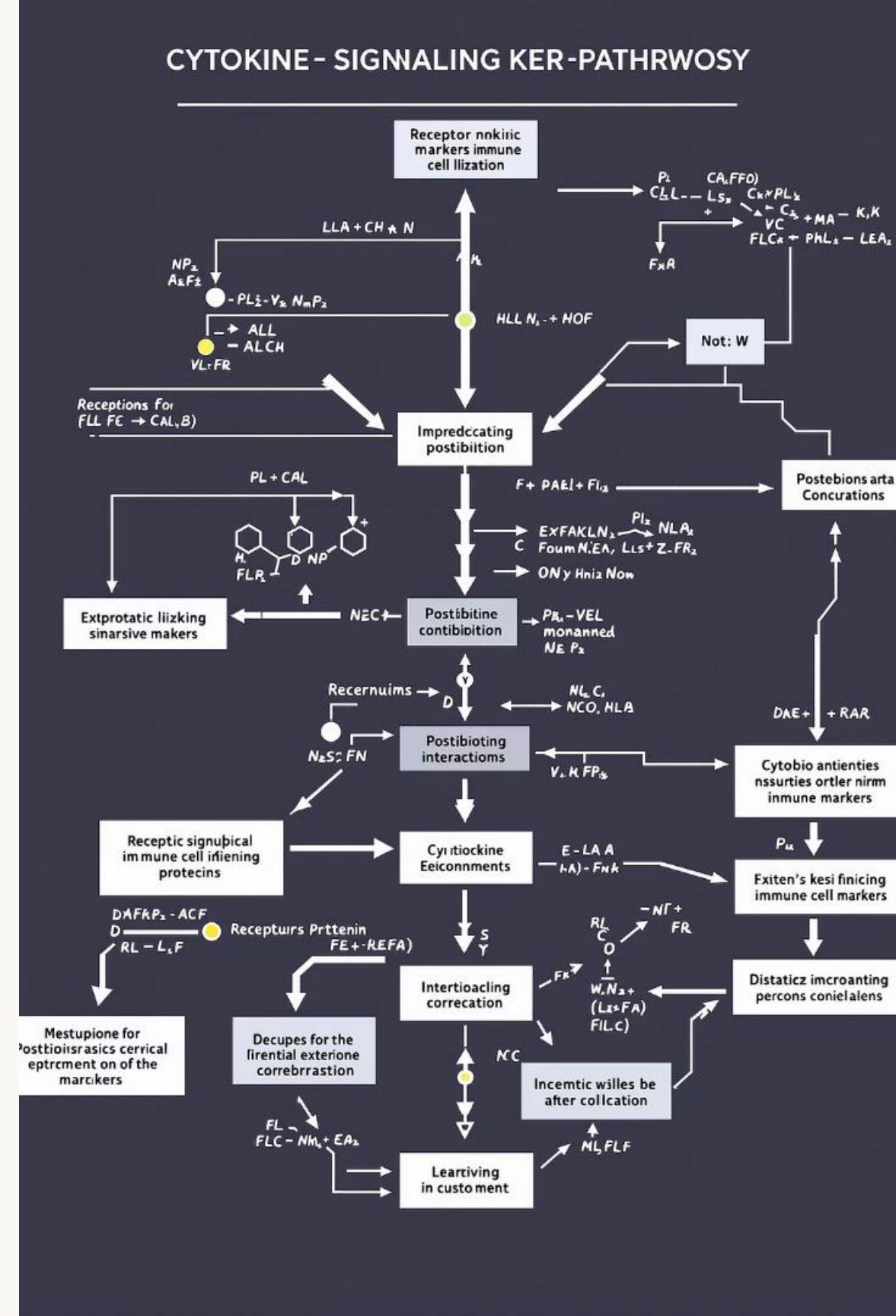
IL-4 Elevation

Promotion of Th2 immune responses

↑65%

IgA Production

Strengthened mucosal immunity through secretory antibodies



Clinical Applications of Postbiotic Immunomodulation

Superior Anti-inflammatory Profile

Postbiotics outperform traditional inflammatory triggers in suppressing harmful inflammation.

Dendritic Cell Programming

L. reuteri 17,938 induces retinoic acid-driven dendritic cells to produce IL-10.

Standardization Requirements

Precise dosing, strain selection, and processing methods are critical for therapeutic success.

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POSTBIOTICS

Comparing Biotics: What Sets Them Apart



Probiotics

Live microorganisms that must survive digestion to provide benefits.



Prebiotics

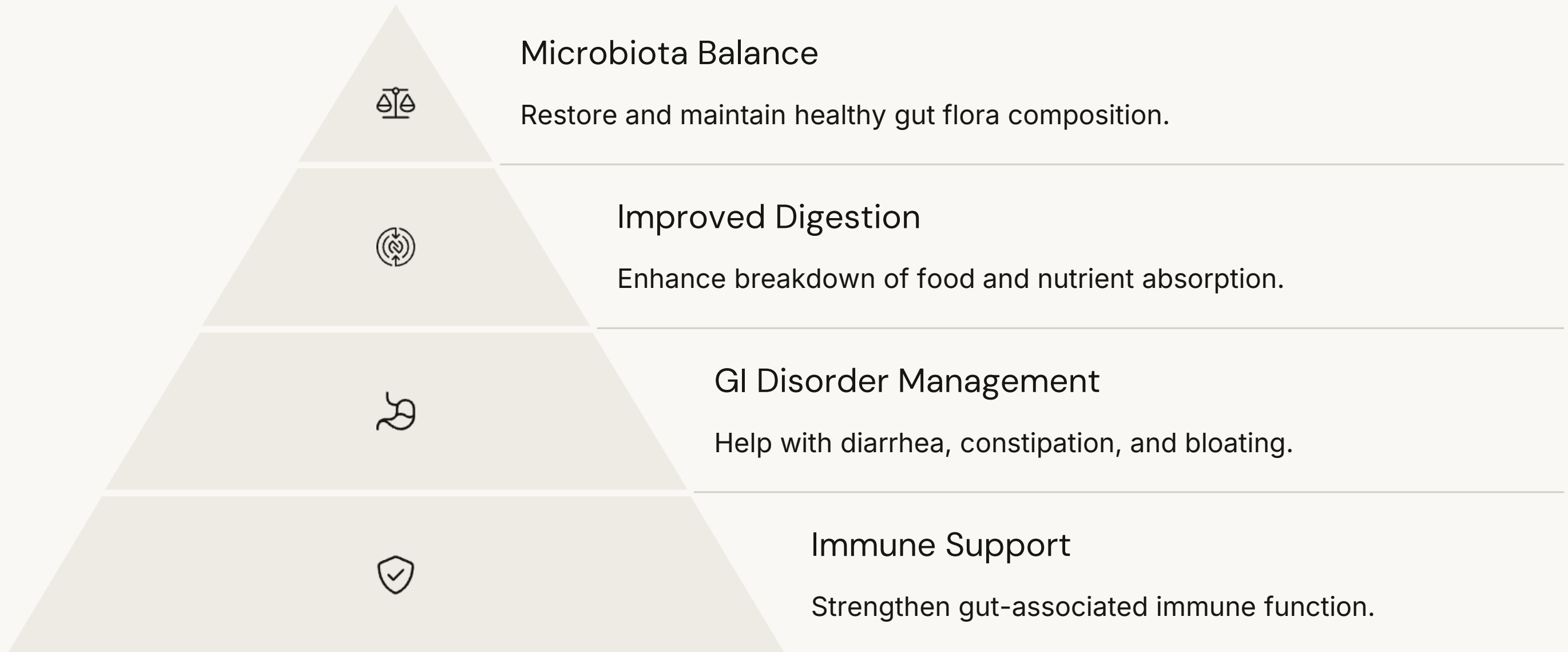
Non-digestible compounds that feed beneficial bacteria in the gut.



Postbiotics

Beneficial compounds derived from probiotic metabolism or dead microbes.

Probiotics and Gut Health



Prebiotics: Nourishing Your Microbiome

Feeding Beneficial Bacteria

Prebiotics provide nutrition for probiotic organisms in the gut.

SCFA Production

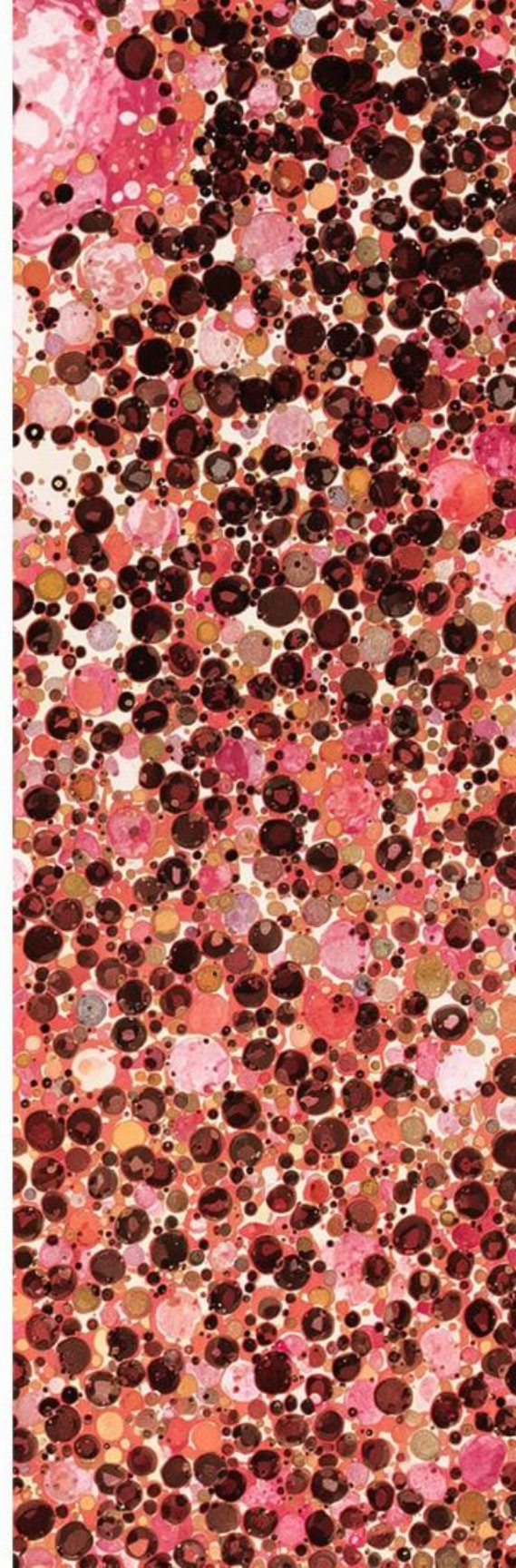
Fermentation of prebiotics produces beneficial short-chain fatty acids.

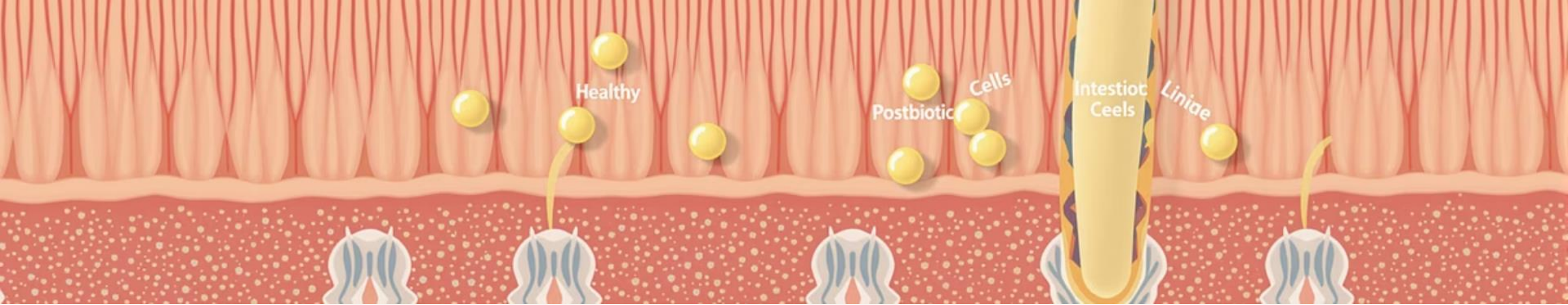
Barrier Enhancement

Prebiotics help strengthen the intestinal barrier function.

Inflammation Reduction

Regular prebiotic consumption helps reduce gut inflammation.





Postbiotics in Gut Health



Microbiome Regulation

Help maintain balanced gut flora without introducing new bacteria.



Intestinal Integrity

Strengthen gut barrier and prevent leaky gut syndrome.



Inflammation Control

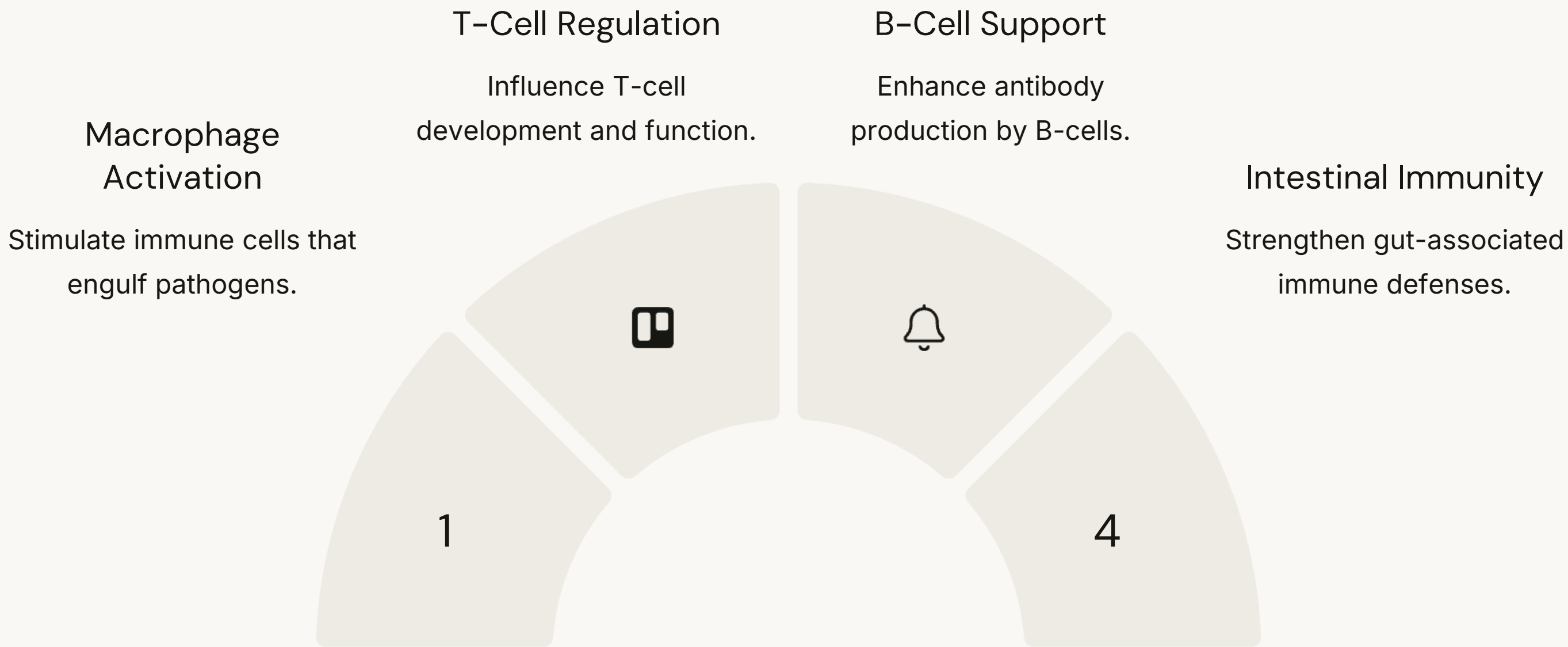
Reduce inflammatory responses in the digestive tract.



Immune Enhancement

Support gut-associated lymphoid tissue function.

Postbiotics and Immune System Modulation



Antibacterial Effects of Postbiotics

Bacteriocins

Natural antimicrobial peptides that target specific pathogens.



E. coli Inhibition

Prevent colonization by harmful *E. coli* strains.

Salmonella Control

Reduce *Salmonella* growth and virulence.

C. difficile Prevention

Help prevent *Clostridium difficile* infections.





Anti-inflammatory Effects of Postbiotics

Inflammatory Bowel Disease

Postbiotics help reduce inflammation in conditions like Crohn's disease and ulcerative colitis.

Arthritis

Systemic anti-inflammatory effects may benefit joint health and reduce arthritis symptoms.

Skin Conditions

Anti-inflammatory properties help manage eczema and other inflammatory skin disorders.

1

2

3

4

1



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Medical applications for various health conditions.



Postbiotic Market Growth

\$1.58B

2021 Market Value

Global postbiotic market valuation.

\$12.8B

2024 Projection

Expected market size by 2024.

11%

Annual Growth

Projected annual growth rate.

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Postbiotic Health Supplements



Capsules

Convenient daily supplements containing concentrated postbiotic compounds.



Powders

Versatile powders that can be mixed into beverages or foods.



Gummies

Tasty, chewable format popular for daily consumption.

Postbiotics in Food and Beverage



Postbiotics are increasingly incorporated into foods and beverages. They enhance preservation, flavor, and shelf life while offering functional health benefits.

Postbiotics in Cosmetics

Skin Microbiome Support

Postbiotics help maintain balanced skin flora for healthy complexion.

- Preserve natural skin barrier
- Prevent pathogen overgrowth
- Support beneficial skin bacteria

Skin Benefits

Postbiotic skincare offers multiple advantages for skin health.

- Reduce inflammation and redness
- Improve acne conditions
- Enhance hydration and moisture retention
- Provide anti-aging benefits

Postbiotics in Animal Feed

Gut Health

Promote balanced gut microbiota in livestock, reducing digestive disorders and improving nutrient absorption.

Immune Function

Enhance animal immunity, reducing disease susceptibility and need for antibiotics.

Growth Performance

Improve feed conversion efficiency and growth rates in livestock production.



Pharmaceutical Applications of Postbiotics

Inflammatory Disease Management

Treating conditions like IBD, Crohn's disease, and ulcerative colitis.

Autoimmune Condition Support

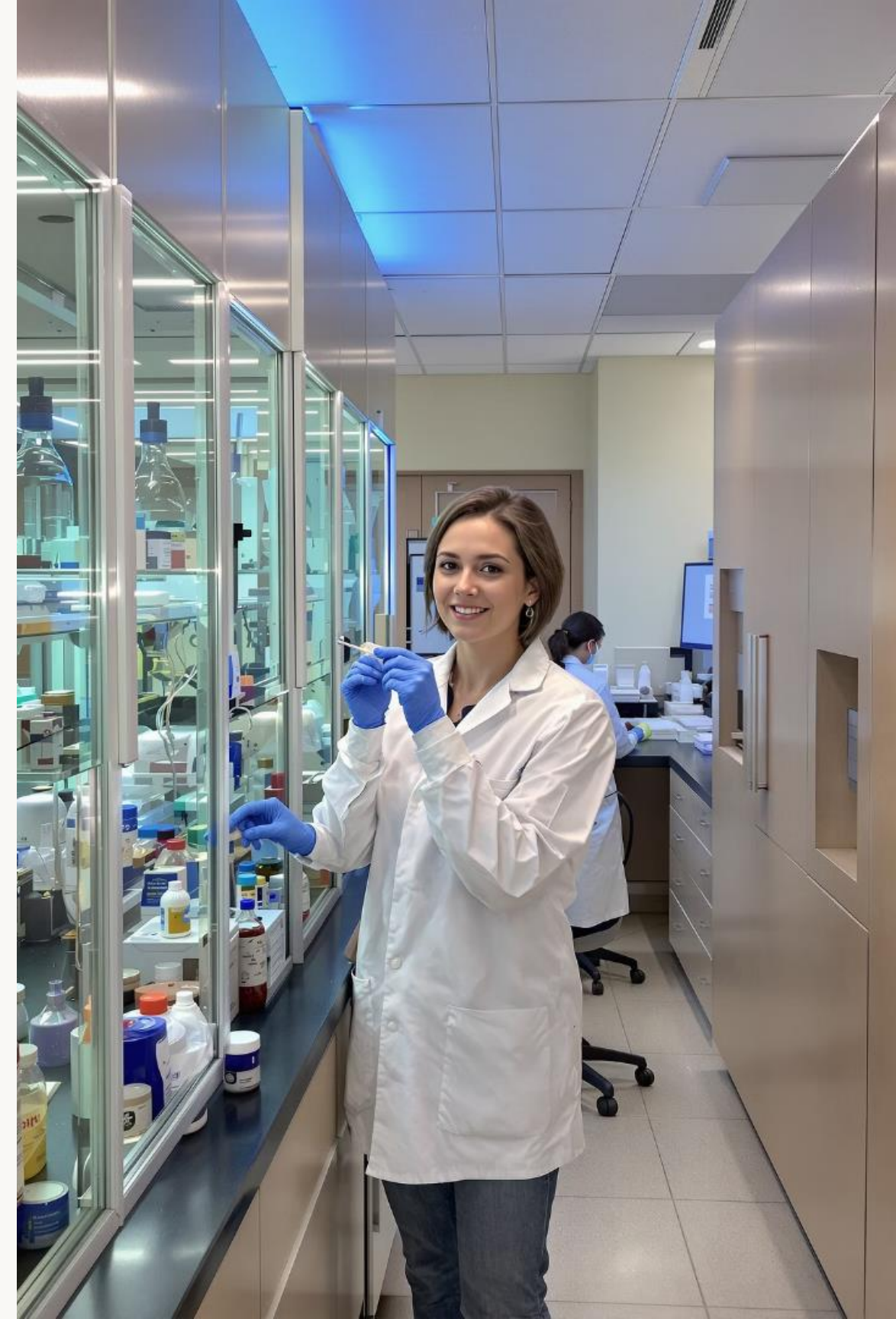
Modulating immune responses in autoimmune disorders.

Gastrointestinal Disorder Treatment

Addressing IBS, diarrhea, and other digestive issues.

Emerging Applications

Research into cancer prevention and pain management.



Postbiotics in Agriculture



Plant Protection

Defend crops against pathogens through antimicrobial properties.



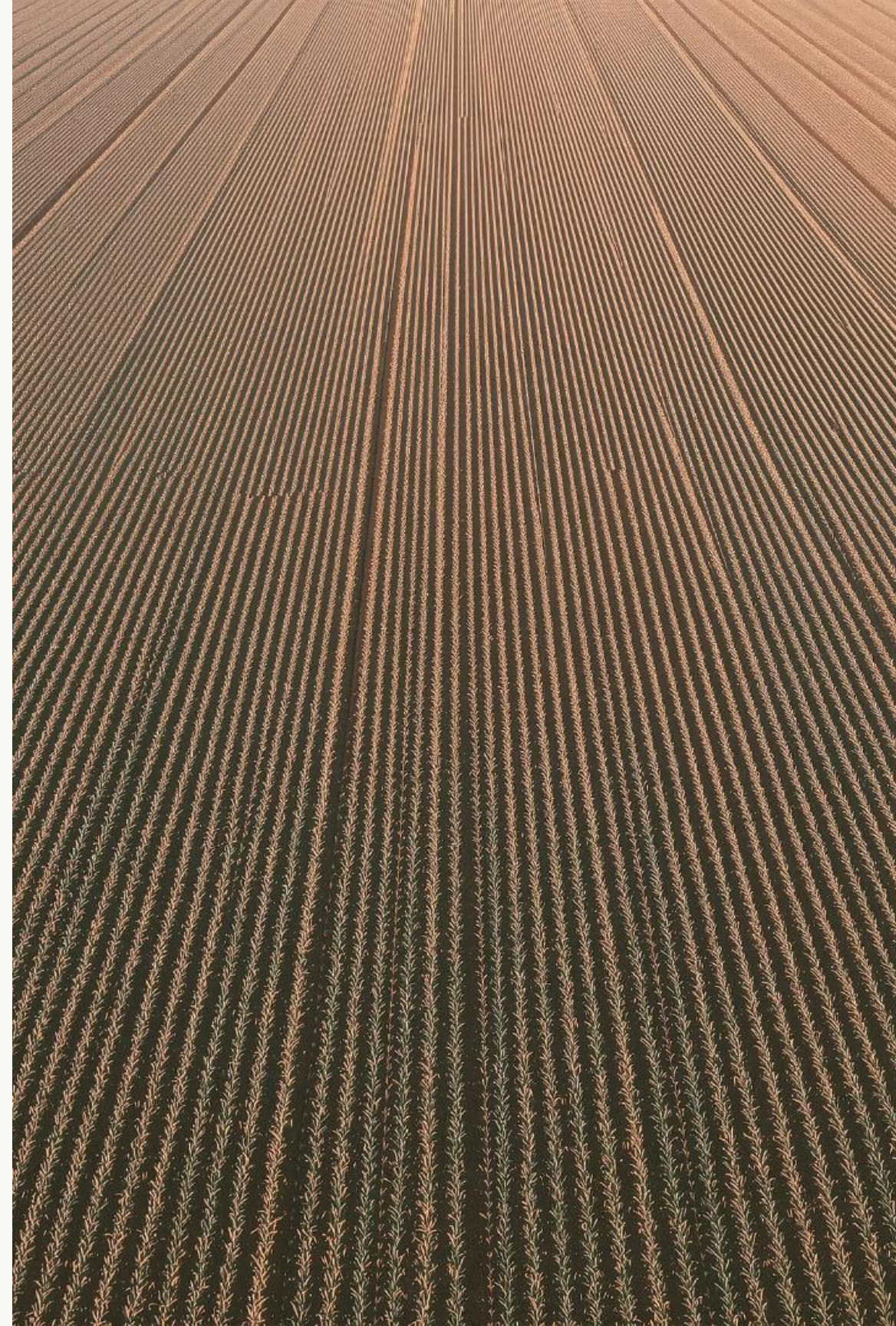
Crop Yield

Increase harvest quantities through improved plant health.



Soil Health

Enhance soil microbiome for better nutrient cycling.



Environmental Applications of Postbiotics



Postbiotics for Weight Management



Postbiotics for Respiratory Health

Mucosal Immunity

Strengthen the immune defenses in respiratory tract mucosa.

Inflammation Reduction

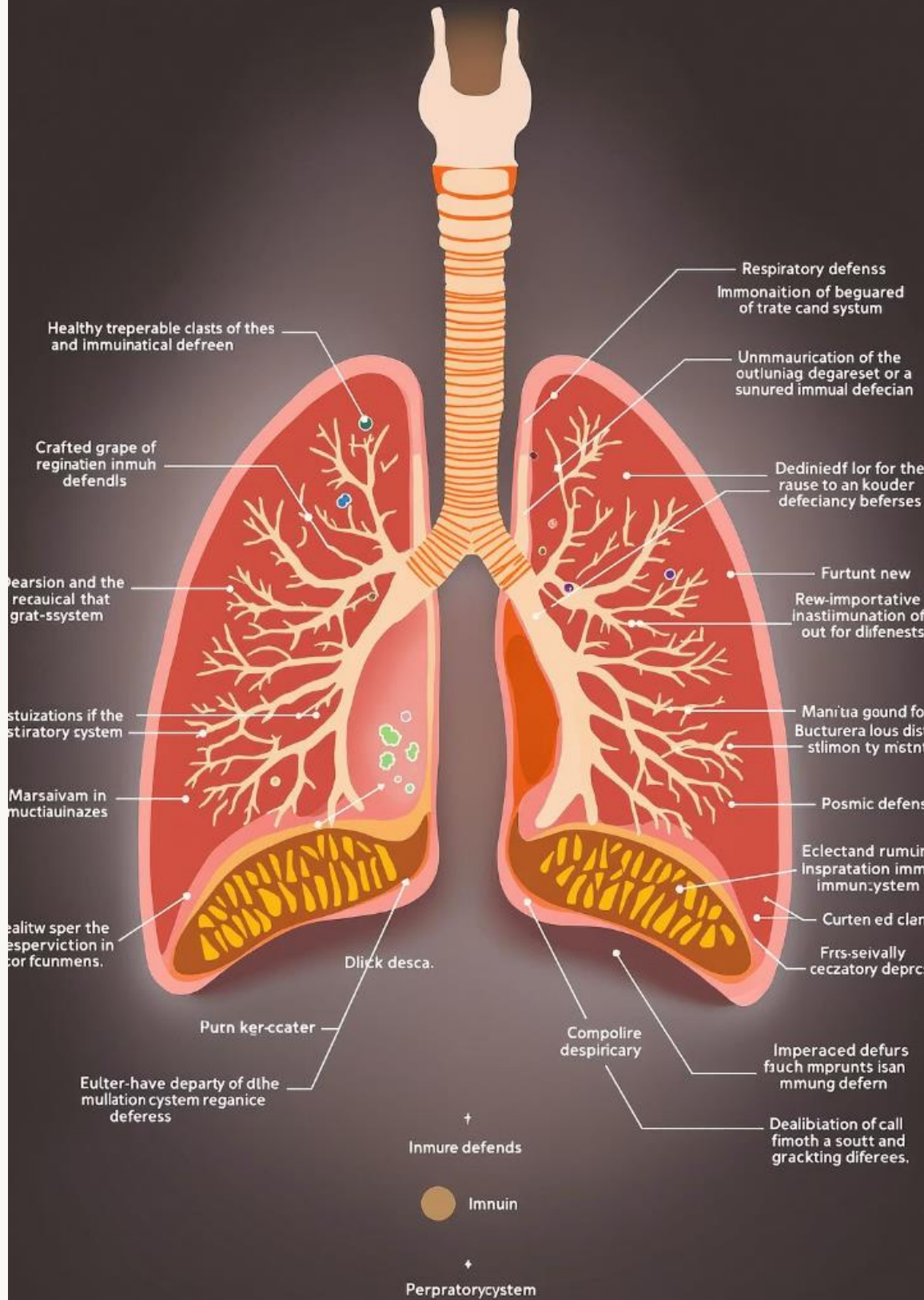
Decrease inflammatory responses in respiratory tissues.

Pathogen Resistance

Enhance resistance against respiratory pathogens and infections.

Symptom Relief

Reduce severity and duration of respiratory infection symptoms.





Postbiotics and Mental Health



Gut-Brain Axis

Influence communication between gut and brain.



Stress Reduction

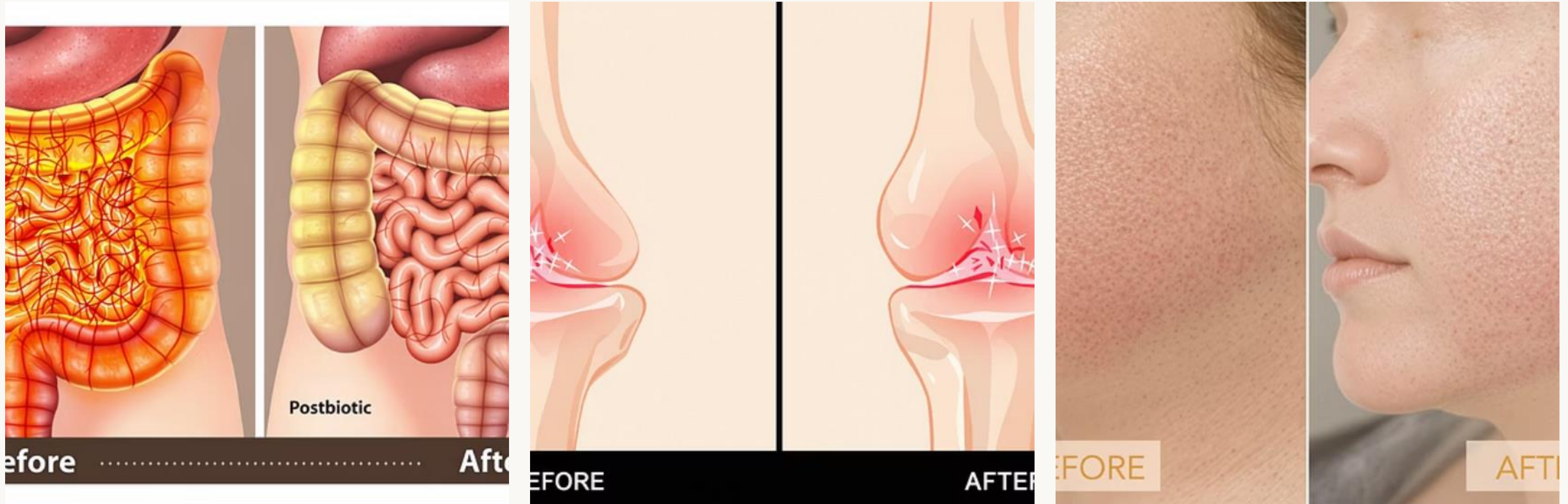
Help lower stress hormones and anxiety responses.



Cognitive Support

Support brain function and mental clarity.

Postbiotics for Inflammatory Diseases



Postbiotics show promise in managing chronic inflammatory conditions. Their anti-inflammatory properties help reduce symptoms in IBD, rheumatoid arthritis, and skin conditions like eczema.

Postbiotics for Weight Management



Postbiotics for Skin Health

Anti-inflammatory Effects

Reduce skin redness, irritation, and inflammatory conditions like acne and eczema.

Calm reactive skin and support healing processes.

Microbiome Balance

Support healthy skin flora diversity and prevent pathogen overgrowth.

Strengthen skin's natural defense mechanisms.

Hydration Improvement

Enhance moisture retention and skin barrier function.

Reduce transepidermal water loss for plumper, healthier skin.



Benefits of Postbiotics: A Growing Evidence Base

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Emerging Field

Postbiotics represent a new frontier in microbiome science.



Scientific Studies

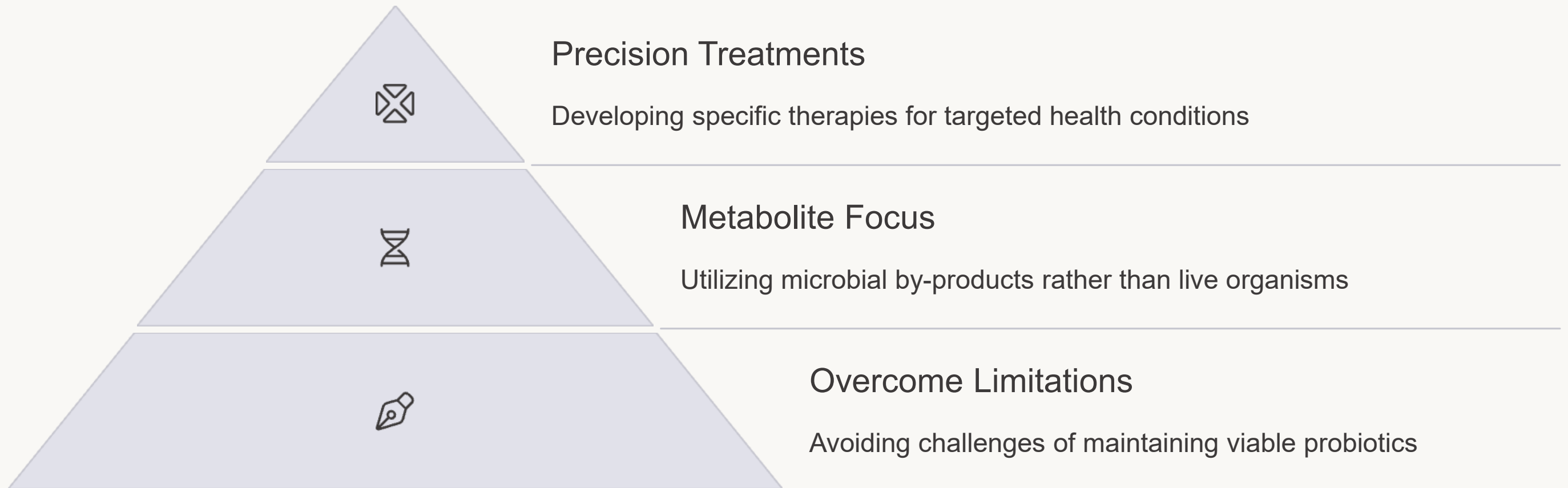
Growing research demonstrates beneficial effects of specific bacterial metabolites.



Health Support

Like pre- and probiotics, postbiotics support host health through improved physiological functions.

The Shift to Postbiotic Therapies





Challenges in Postbiotic Production



Scalability

Scaling up production while maintaining consistency and quality.



Product Consistency

Ensuring uniform composition and potency across batches.



Bioactivity Preservation

Maintaining the biological activity of compounds over time.



Extraction Efficiency

Optimizing methods to isolate and purify postbiotic compounds.

Quality Control in Postbiotic Manufacturing

Raw Material Testing

Verify quality and purity of starting materials and microbial strains.

Process Monitoring

Control fermentation conditions and production parameters.

Compositional Analysis

Analyze final product for specific bioactive compounds.

Safety Assessment

Test for contaminants and verify product safety.

Efficacy Verification

Confirm biological activity and health benefits.



Postbiotic Stability and Storage

Temperature Control

Many postbiotics require specific temperature ranges to maintain stability, though they're generally more stable than probiotics.

Moisture Protection

Exposure to moisture can degrade certain postbiotic compounds, requiring appropriate packaging and storage conditions.

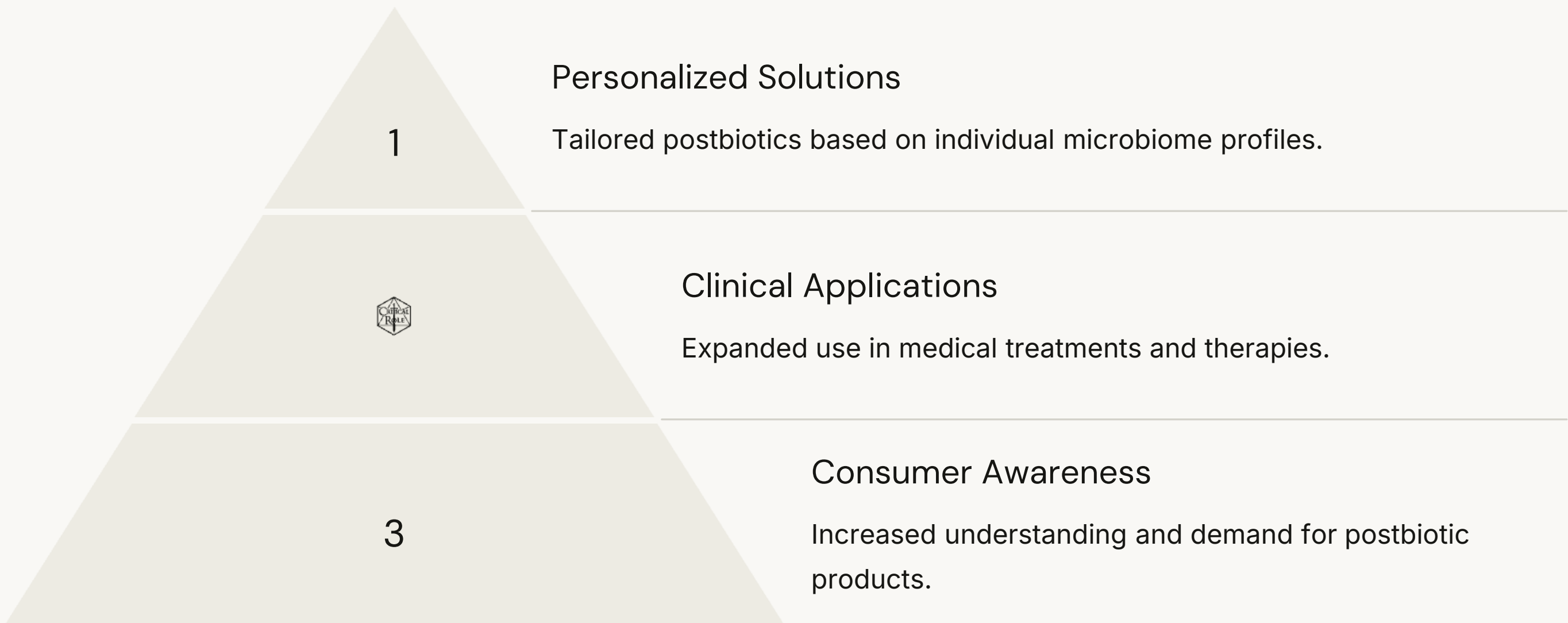
Light Sensitivity

Some postbiotics are photosensitive and must be protected from light to preserve their bioactivity.

Shelf Life

Postbiotics typically offer longer shelf life than probiotics, but still require proper storage for maximum efficacy.

The Future of Postbiotics



Innovations in Postbiotic Research



New Strains

Identifying novel microbial strains with unique postbiotic profiles.



Improved Extraction

Developing more efficient methods to isolate and purify compounds.



Novel Applications

Exploring new uses beyond traditional gut and immune health.



Delivery Systems

Creating targeted delivery mechanisms for specific body sites.





Postbiotic Product Comparison

Product	Manufacturer	Type	Main Benefit
HT-BPL1™	ADM	Heat-killed Bifidobacterium	Metabolic health
EpiCor®	Cargill	Fermented yeast	Immune health
Lacteol Fort	Ipsen Pharma	Heat-killed Lactobacillus	Acute diarrhea
GanedenBC30®	Kerry Group	Inactivated Bacillus	Digestive health

Mechanism of Action: EpiCor®

Immune Modulation
Balances immune responses for optimal function.

Viral Defense
Reduces cold and flu symptom severity and duration.



Mucosal Immunity
Enhances immune defenses at mucosal surfaces.

Respiratory Support
Strengthens respiratory tract immune function.

Mechanism of Action: Lacteol Fort

1

Pathogen Inhibition

Inhibits growth of diarrhea-causing bacteria.

2

Microbiome Restoration

Helps restore balanced intestinal flora.

3

Inflammation Reduction

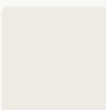
Decreases intestinal inflammation during diarrhea.

Mechanism of Action: GanedenBC30®



SCFA Production

Increases short-chain fatty acids for gut health.



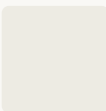
Microbiota Modulation

Supports balanced gut flora composition.



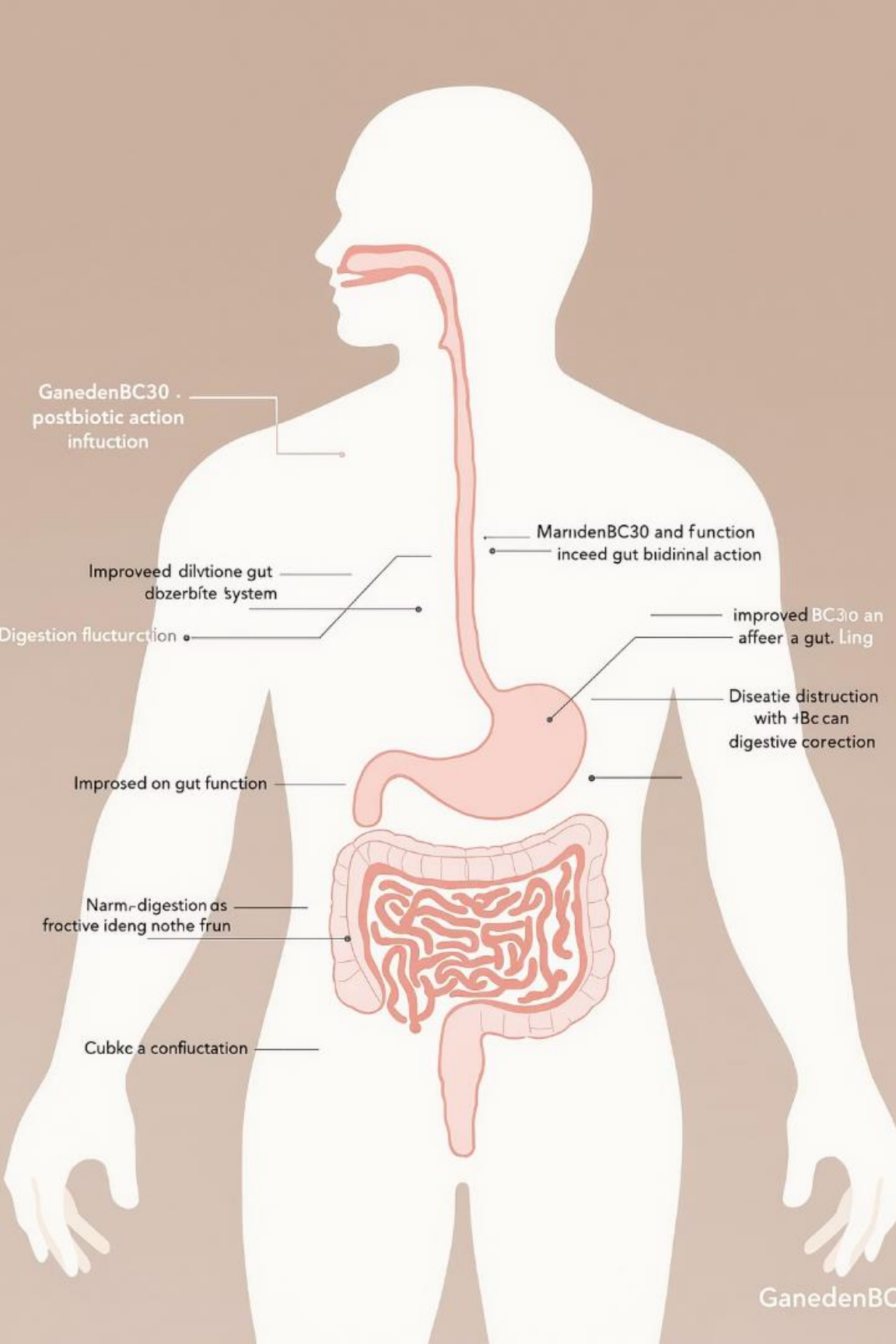
Digestive Support

Enhances digestive processes and nutrient absorption.



Immune Response

Supports healthy immune function through gut-immune axis.



Pro-B[®]: Combined Biotic Approach

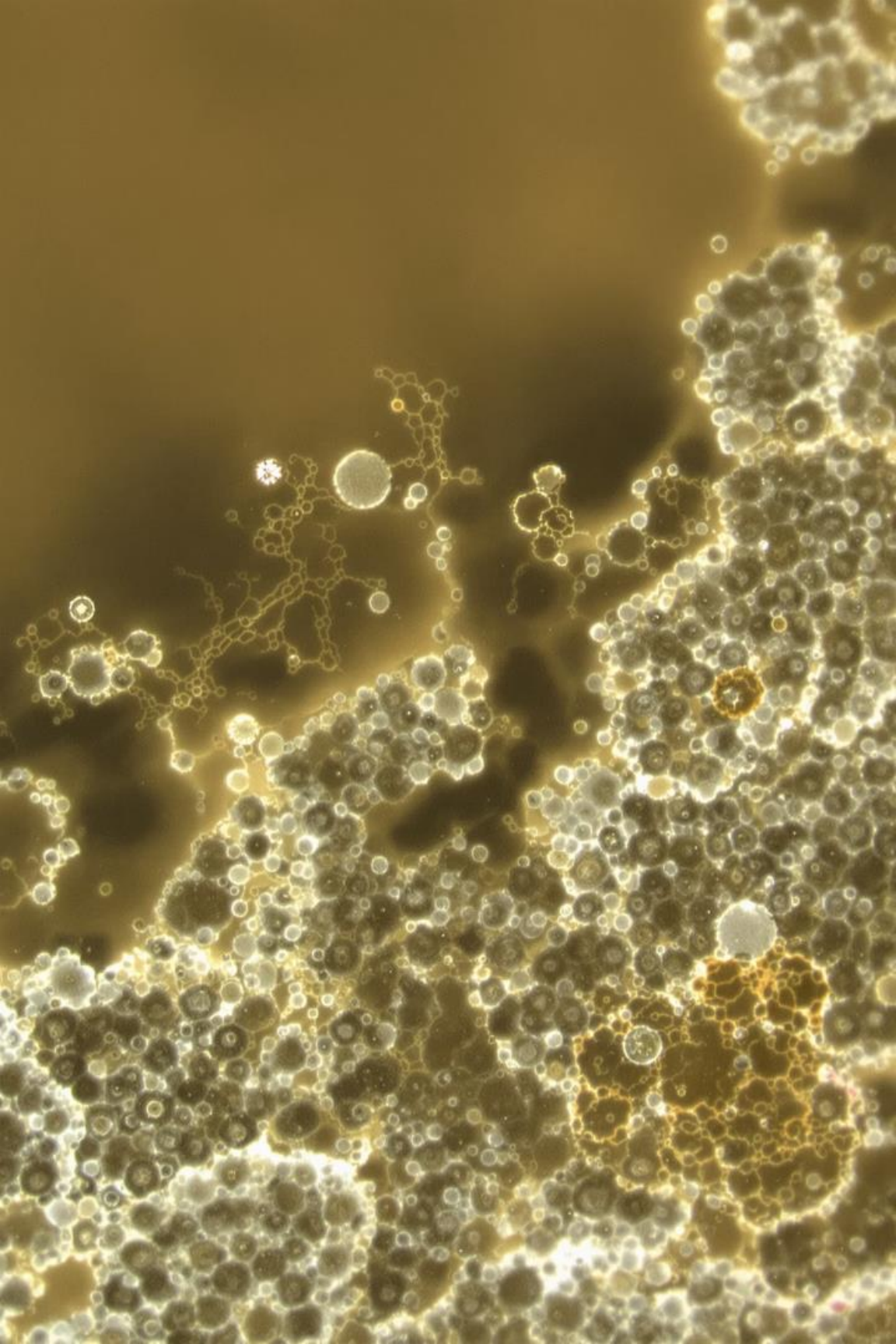
Composition

Unique blend combining probiotics, prebiotics, and postbiotics.

Manufactured by ProBiota for comprehensive gut support.

Benefits

- Enhanced gut flora balance
- Improved digestion
- Immune modulation
- Stimulates macrophages and cytokine production



Lactobacillus rhamnosus GR1®

Manufacturer

Produced by UAS
Laboratories, specialists in
probiotic and postbiotic
solutions for specific health
applications.

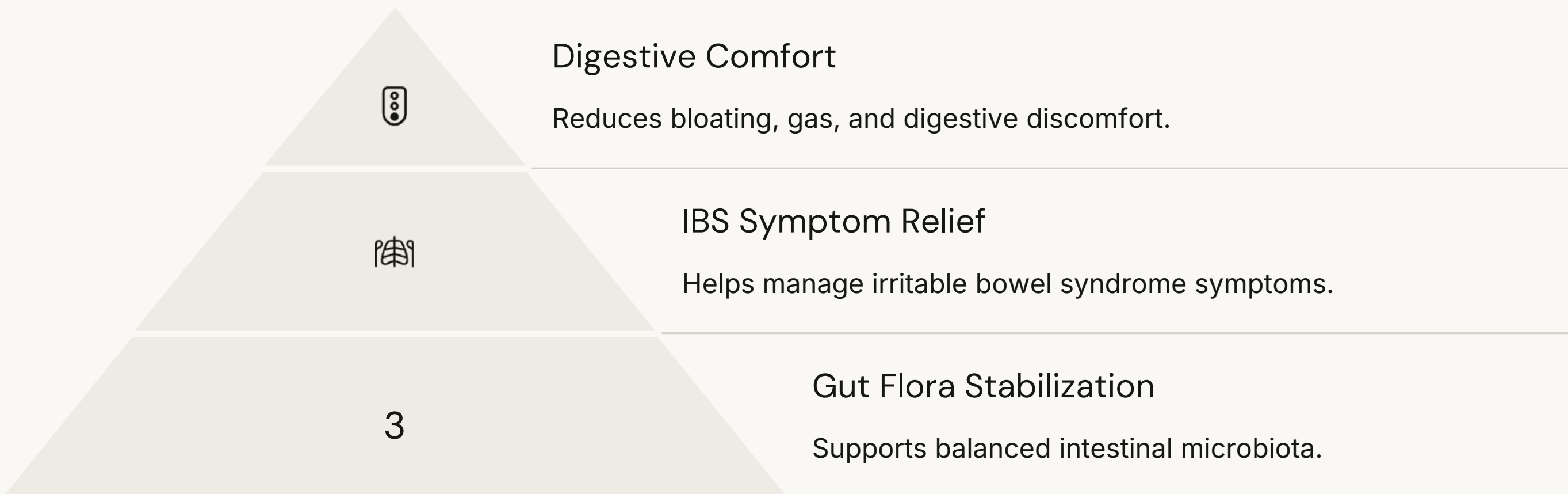
Composition

Contains heat-killed
Lactobacillus rhamnosus,
providing targeted postbiotic
benefits for urogenital health.

Key Benefits

Supports urogenital health, helps prevent urinary tract infections,
and promotes vaginal microbiome balance.

LactoSpore[®]: Digestive Health Solution



Bio-K+[®]: Inflammatory Bowel Support

Microbiota Enhancement

Improves gut microbiota diversity and balance.

Barrier Strengthening

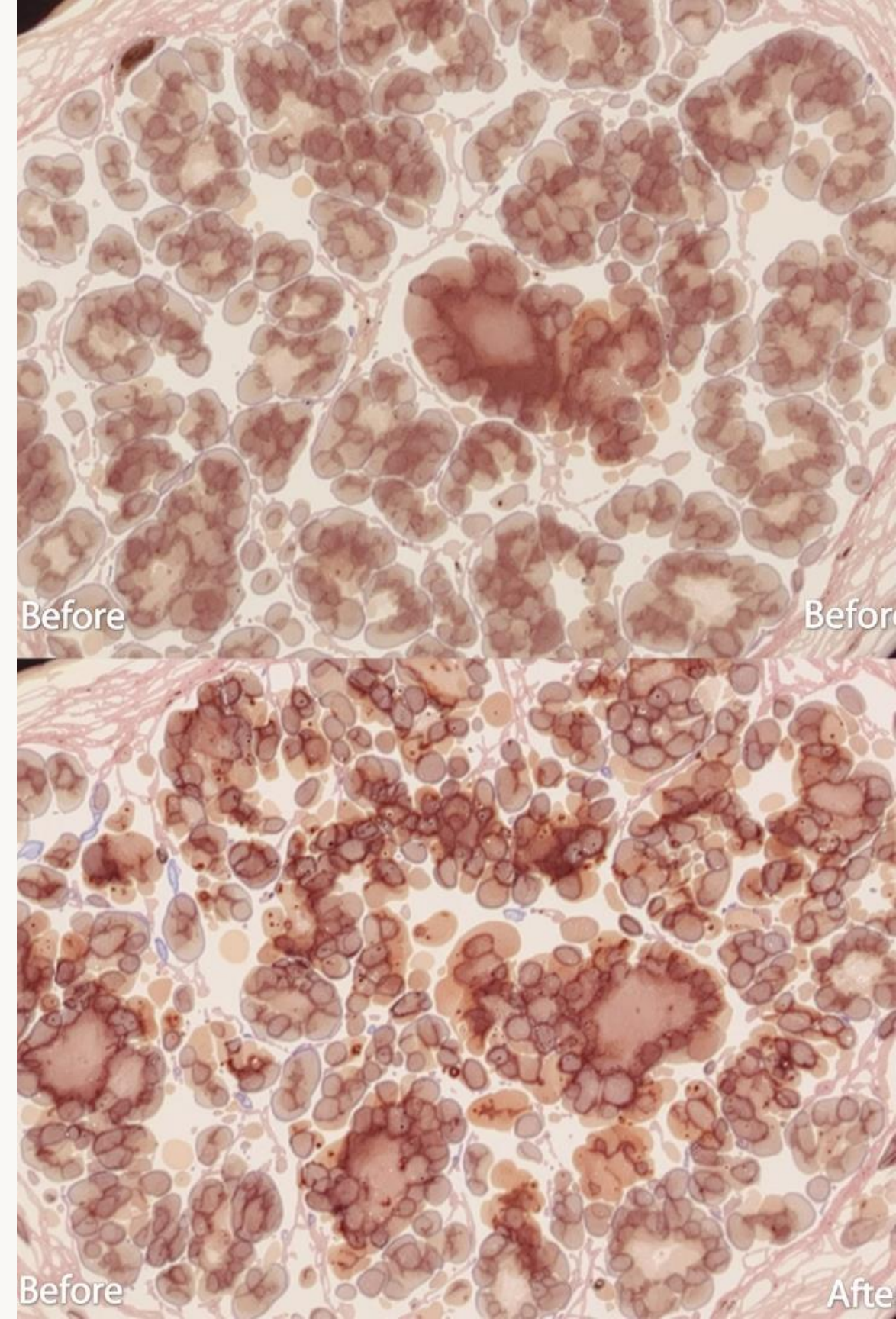
Reinforces intestinal barrier function.

Immune Modulation

Balances immune responses in the gut.

Inflammation Control

Reduces inflammatory processes in IBD and IBS.



ProBioFem™: Women's Health

Vaginal Microbiota

Modulates vaginal flora for optimal balance.

1



Barrier Function

Enhances mucosal barrier protection.

Comfort & Health

Promotes overall vaginal comfort and health.

4

3

Pathogen Prevention

Helps prevent overgrowth of harmful organisms.

Immuno-Biotic®: Immune Support



Immune Cell Activation

Stimulates immune cells for optimal function.



Cytokine Production

Boosts production of immune signaling molecules.



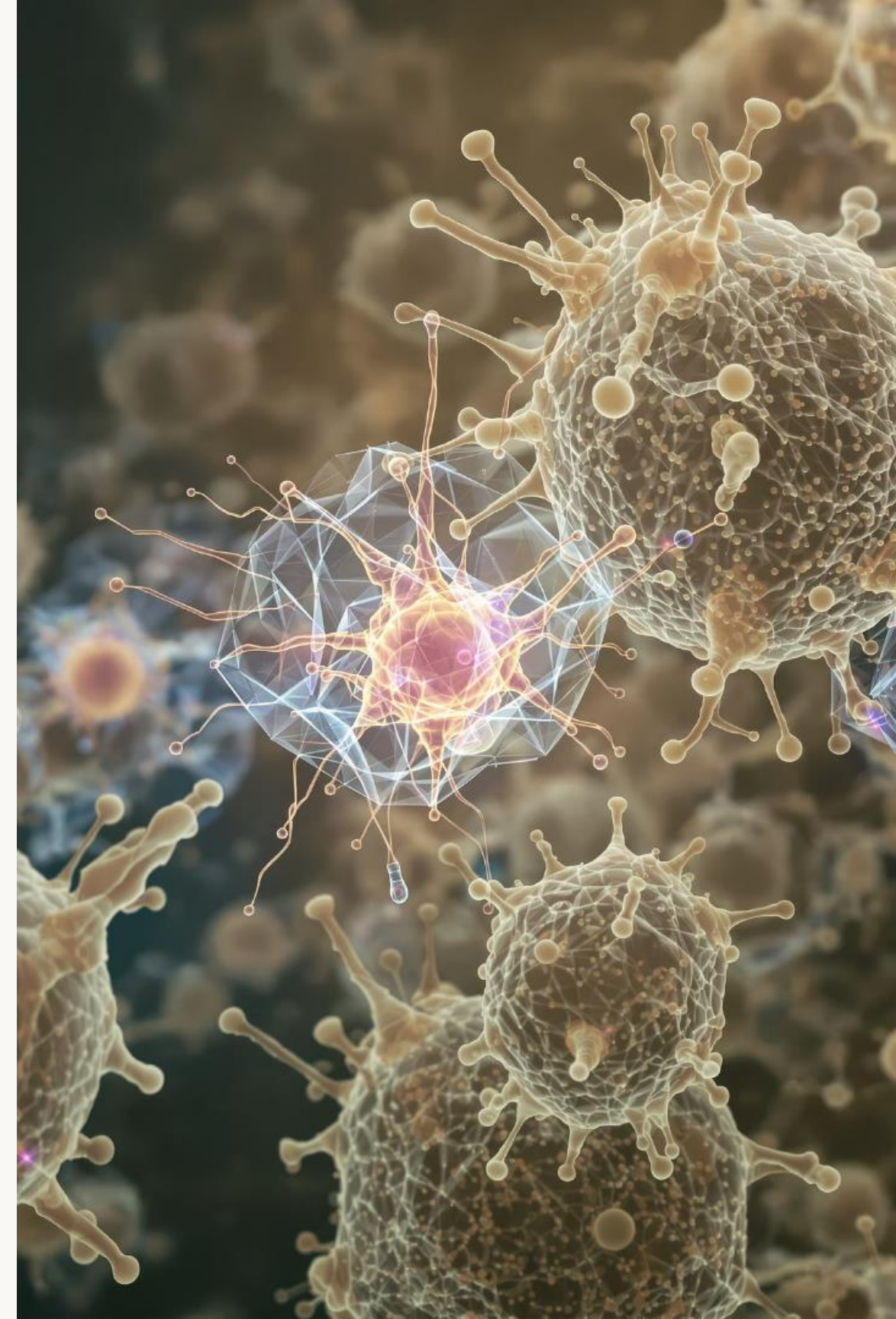
Microbiota Balance

Promotes healthy gut flora composition.



Defense Enhancement

Strengthens body's natural defense mechanisms.



Bifidobacterium Longum BB536

Manufacturer

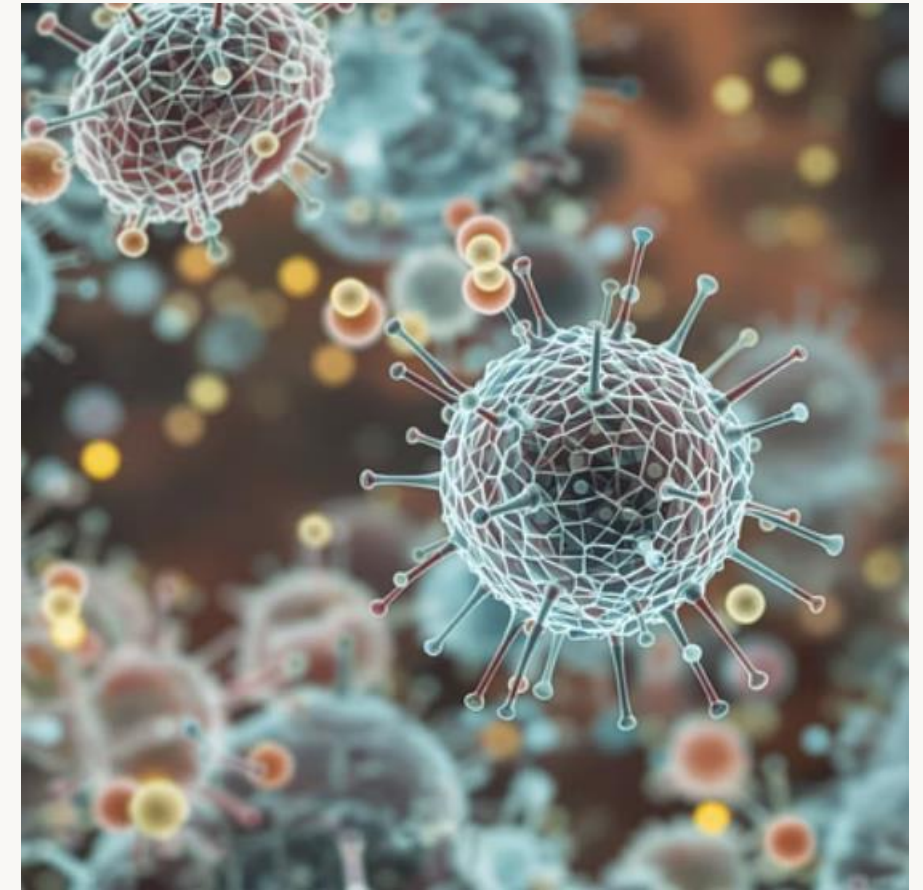
Produced by Yakult, a pioneer in probiotic and postbiotic research.

Developed through extensive clinical research on gut health.

Benefits for IBS

- Modulates gut flora composition
- Reduces intestinal inflammation
- Enhances gut barrier function
- Alleviates IBS symptoms like bloating and discomfort

BactoFlor®: Comprehensive Gut Support



BactoFlor® from Bactolac Pharmaceuticals contains **heat-killed Lactobacillus and Bifidobacterium strains**. It restores gut microbiota balance, reduces gastrointestinal discomfort, and modulates immune responses for comprehensive digestive health.

GutGard[®]: Gut Inflammation Solution

1

Inflammation Reduction

Decreases inflammatory processes in the gut.



Gut Lining Support

Strengthens intestinal barrier function.

3

Permeability Prevention

Reduces gut permeability and leaky gut syndrome.

Bio-tract[®]: Targeted Release Technology



Protection

Shields postbiotics from stomach acid degradation.

2

Controlled Release

Delivers postbiotics gradually throughout digestive tract.

3

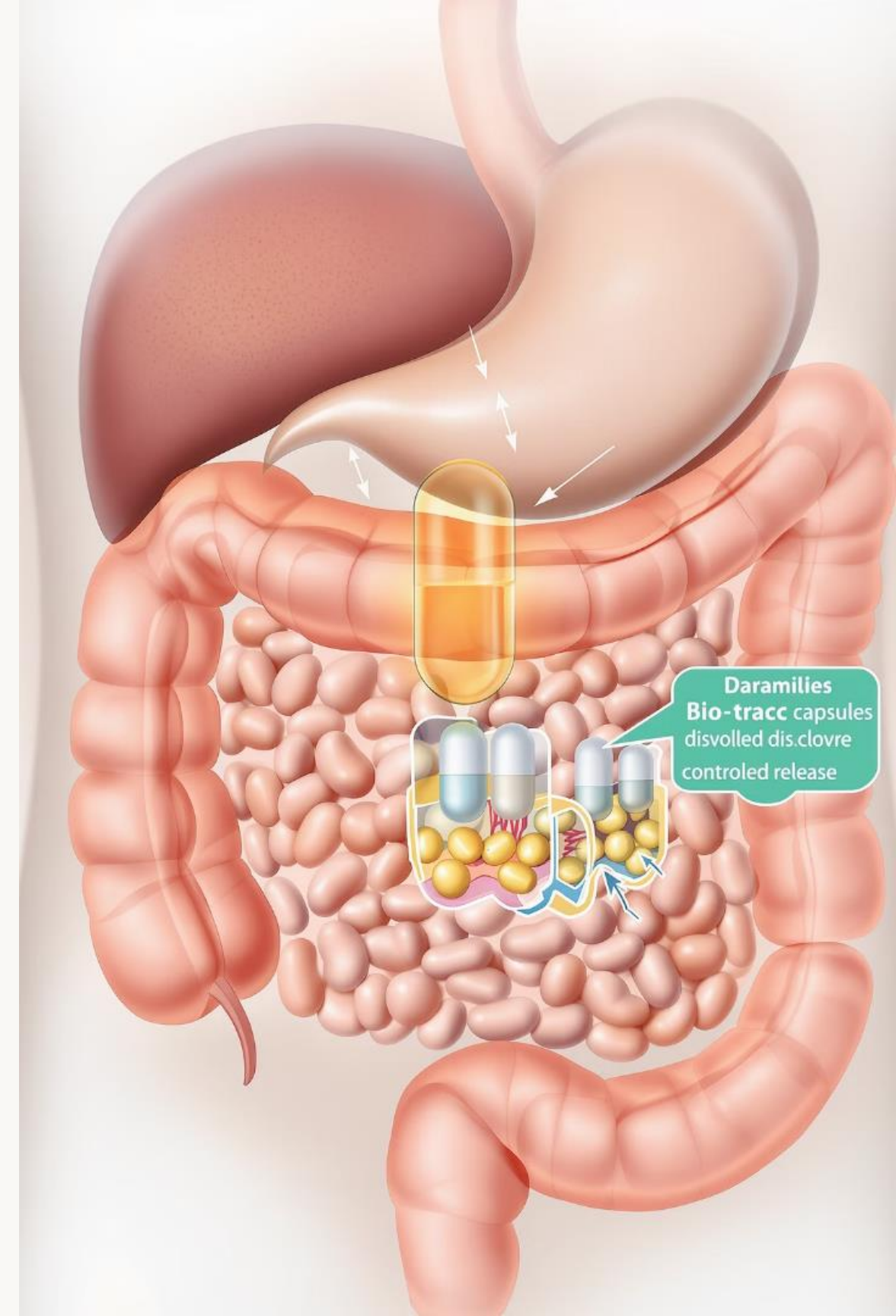
Enhanced Absorption

Improves nutrient uptake and digestive efficiency.

4

Inflammation Control

Reduces gut inflammation for improved comfort.



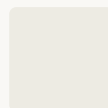


Actinoquin[®]: Multi-Benefit Formula



Digestive Health

Combines probiotics and postbiotics for comprehensive gut support.



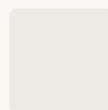
Immune Function

Boosts immunity through multiple pathways.



Skin Health

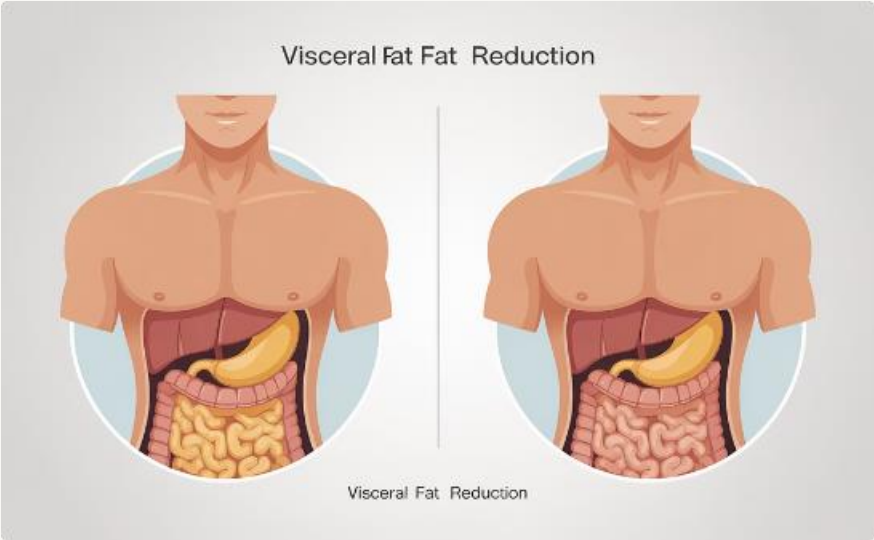
Reduces skin inflammation and supports skin microbiome.



Microbiota Balance

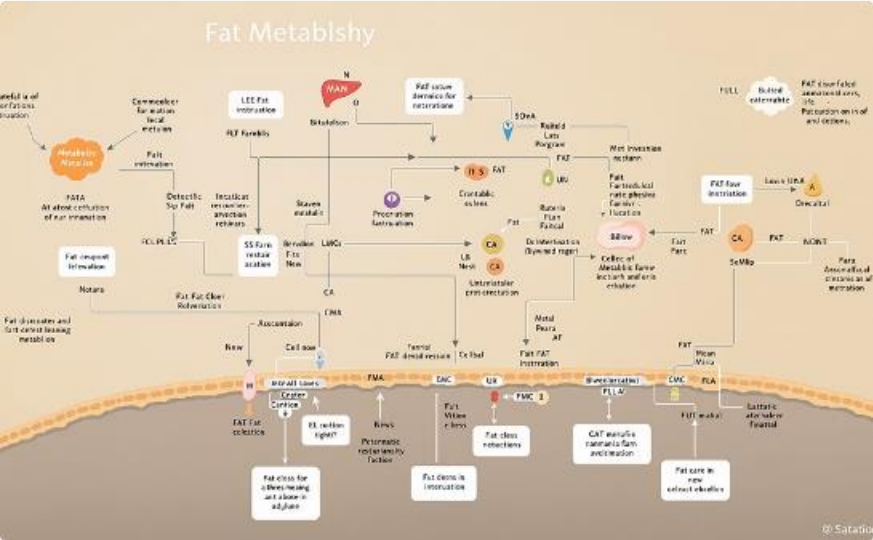
Modulates gut flora for optimal digestive function.

Lactobacillus gasseri TMC0356: Weight Management



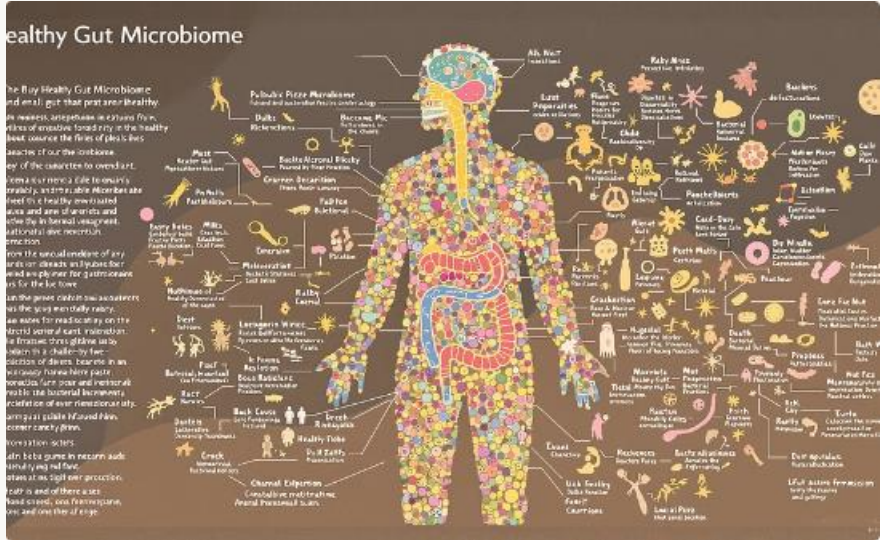
Visceral Fat Reduction

Helps reduce harmful fat around internal organs.



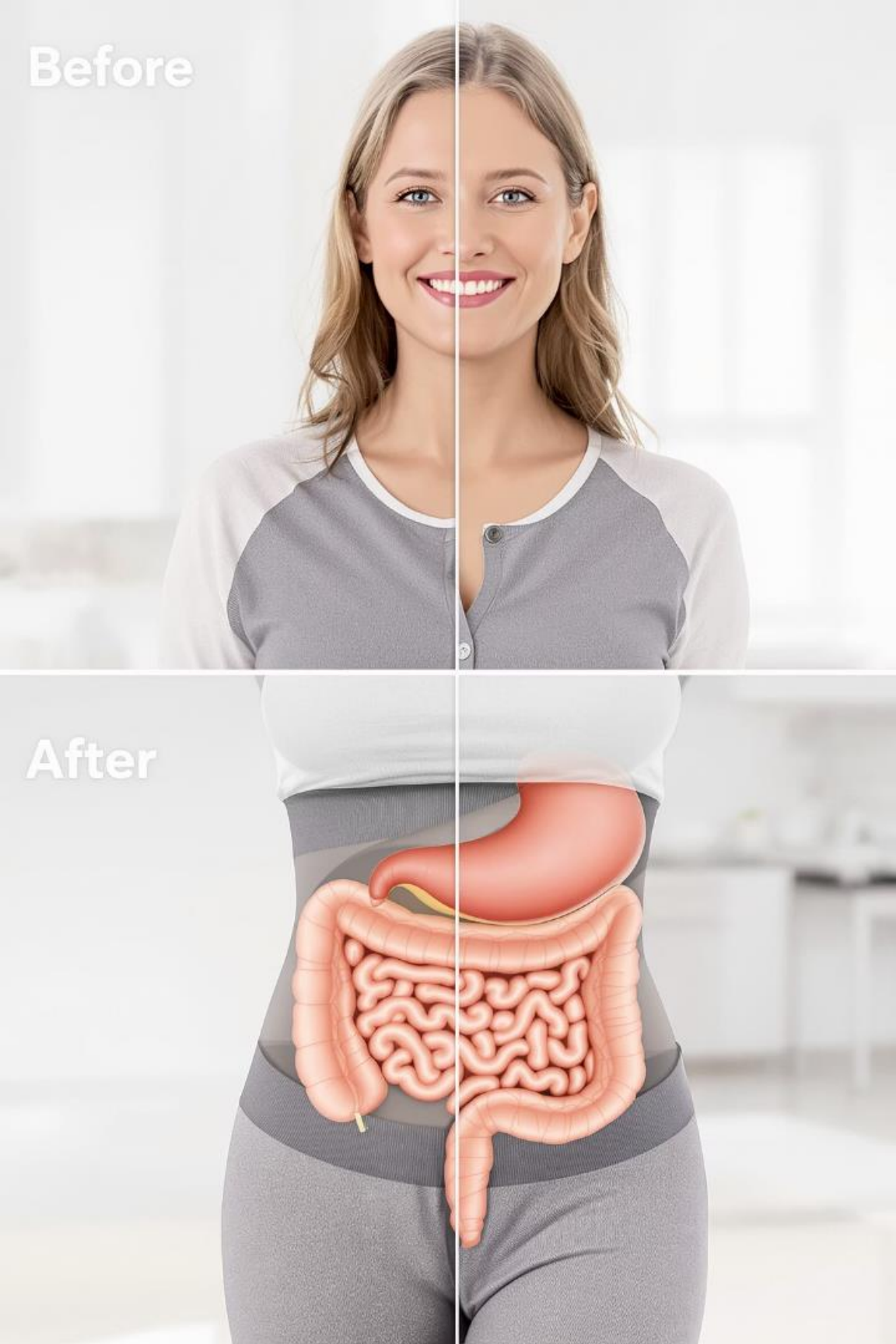
Fat Metabolism

Modulates metabolic pathways involved in fat processing.



Gut Microbiota

Enhances gut flora balance to support weight management.



Lactobacillus plantarum 299v: Anti-Bloating Solution

Manufacturer

Developed by Probi, a leading company in microbiome research and postbiotic development.

Gut Microbiota Modulation

Helps establish and maintain balanced gut flora for optimal digestive function.

Bloating Reduction

Significantly reduces bloating and gas production for improved digestive comfort.

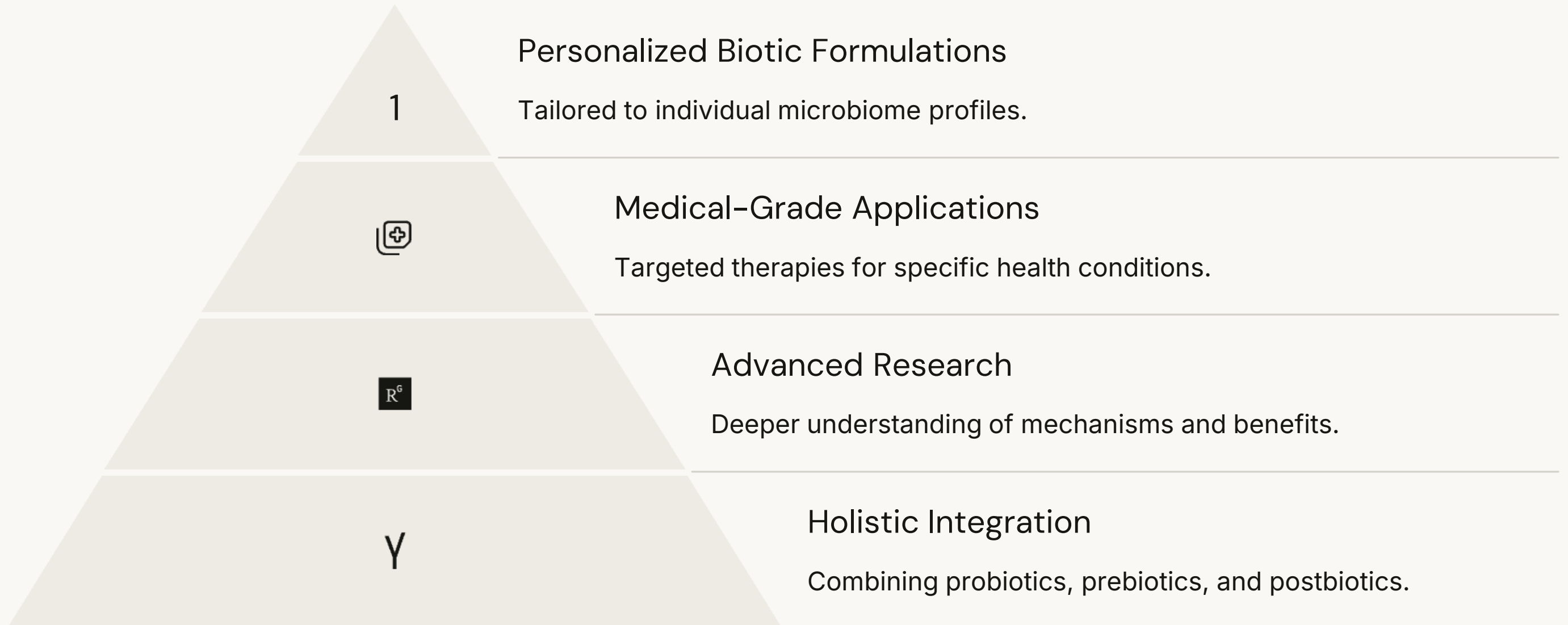
Intestinal Barrier

Enhances gut barrier function to prevent leaky gut and related issues.

Combiotic®: Synergistic Approach



The Future of Biotics: Integrated Health Solutions



Unlocking the Power of Microbiome Skincare

Caring for skin bacteria should be a major focus of your skincare routine.





What Is The Skin Microbiome?



Millions of Microorganisms

Bacteria, viruses, fungi living on skin surface



Protective Barrier

Defends against pathogens



Maintains Balance

Keeps skin healthy and in homeostasis

Why Your Microbiome Matters

Skin Protection

Acts as additional barrier layer

Defends against external threats

Skin Health

Creates enzymes skin needs

Maintains moisture and suppleness

Problem Prevention

Helps prevent acne, dryness,
inflammation

Balances skin ecosystem



Signs of Microbiome Imbalance

Persistent Acne

Breakouts that won't clear despite treatment

Dry, Irritated Skin

Flaking, redness, and discomfort

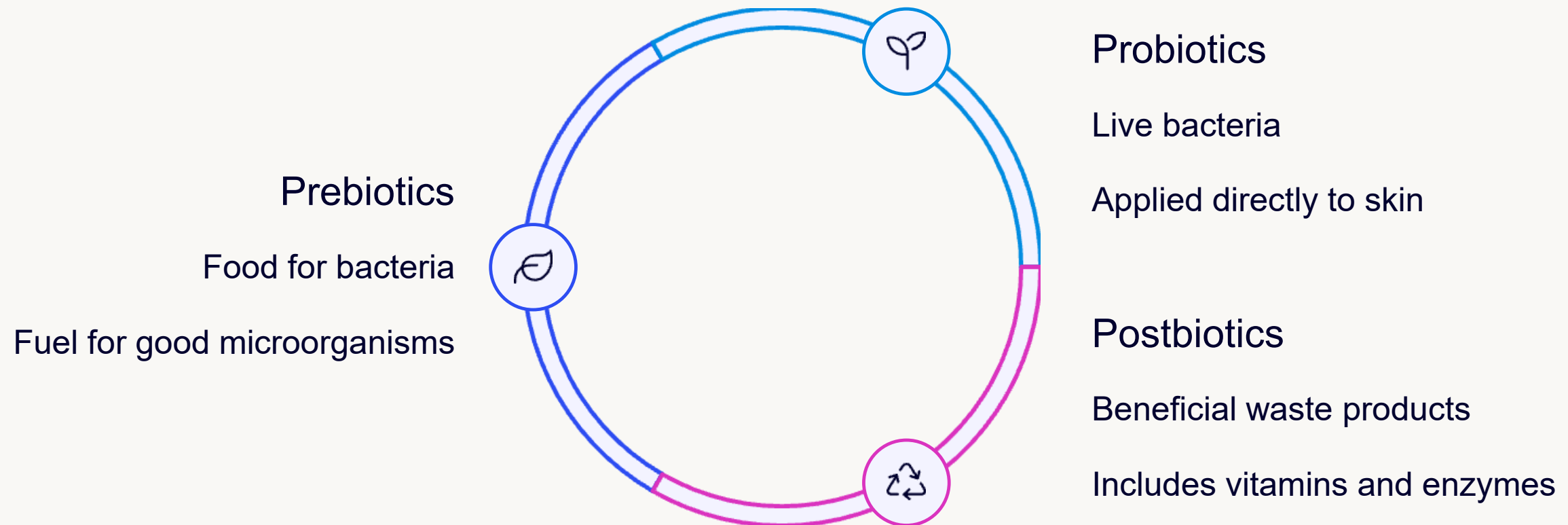
Product Sensitivity

Skin reacts negatively to previously tolerated products

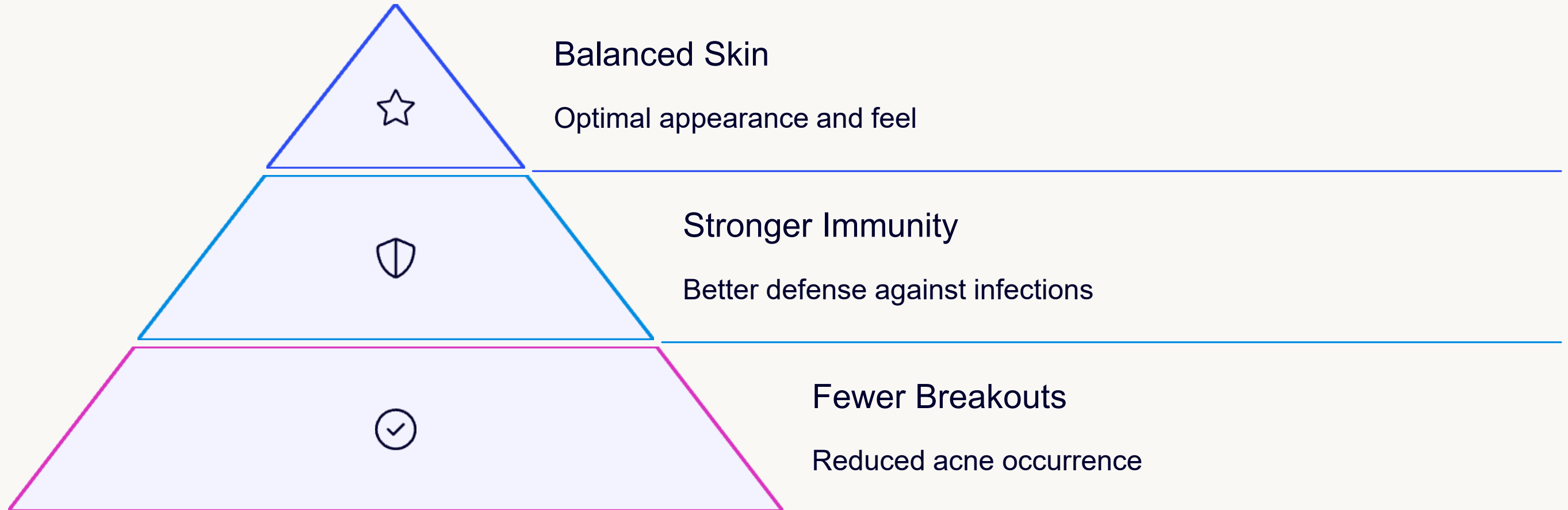
Inflammation

Ongoing redness and swelling

Types of Microbiome Support



Benefits of a Healthy Microbiome



A thriving microbiome produces beneficial waste that moisturizes and nourishes skin while creating an environment where harmful bacteria can't thrive.

Common Microbiome Disruptors



Harsh
Cleansers

Strip
beneficial
bacteria



Sun
Damage

UV rays harm
microorganis
ms



Fragrances

Irritate and
disrupt
balance



Alcohol in
Products

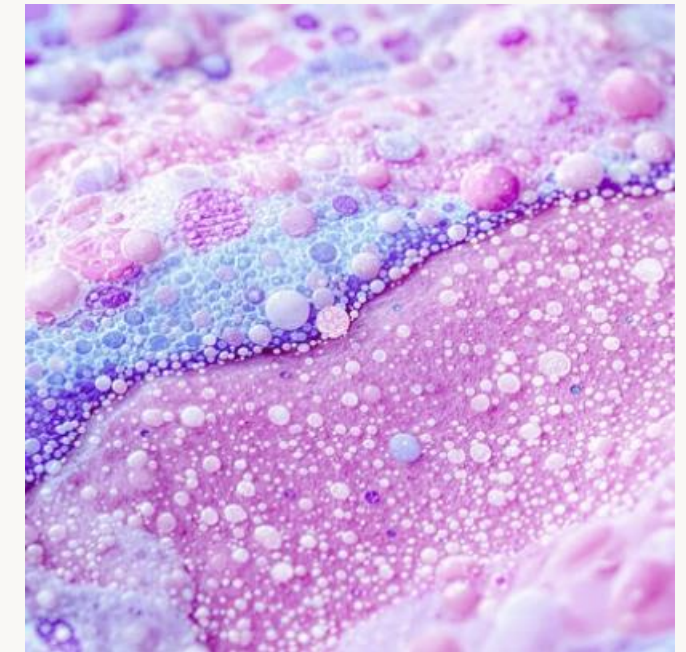
Dries and kills
good bacteria



Sun Protection Is Essential



Signs Your Microbiome Is Improving



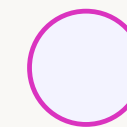
Fewer Breakouts

Reduced frequency and severity of acne



Balanced Hydration

No more extreme dryness or oiliness



Reduced Sensitivity

Less reactivity to products and environment

Postbiotics in Skincare and Cosmetics

Postbiotics represent a cutting-edge innovation in the skincare and cosmetics industry. Unlike probiotics, these non-viable by-products or metabolites derived from probiotics don't require live bacteria to deliver their beneficial effects.

These bioactive compounds have gained significant attention for their stability, safety, and ability to enhance skin health, making them ideal for cosmetic formulations. As we explore their applications, benefits, and market trends, you'll discover why postbiotics are revolutionizing the beauty industry.



Common Postbiotics in Skincare

Lactobacillus-Derived

Lactic acid, acetate, and butyrate are commonly used in skincare formulations for their ability to support the skin's natural barrier, reduce inflammation, and balance the microbiome.

Short-Chain Fatty Acids

These compounds help maintain skin pH balance and strengthen barrier function, making them essential for healthy skin maintenance.

Bacteriocins

Natural antimicrobial peptides that help regulate the skin's microbiome by selectively inhibiting harmful bacteria while preserving beneficial ones.



Direct vs. Indirect Mechanisms

Direct Effects

Attributed to specific bioactive molecules such as SCFAs and bacteriocins that interact directly with skin cells and structures.

These compounds can penetrate the skin barrier to deliver targeted benefits like inflammation reduction and cellular repair.

Indirect Effects

Involve modulation of the skin's microbiome by encouraging beneficial microbes and inhibiting harmful ones.

This creates an environment where the skin's natural ecosystem can thrive, leading to improved overall skin health and appearance.

Anti-inflammatory Properties

Reduce Chronic Inflammation

Postbiotics help modulate the skin's immune response

Balance Immune Response

Prevent overreaction to harmless stimuli



Alleviate Skin Conditions

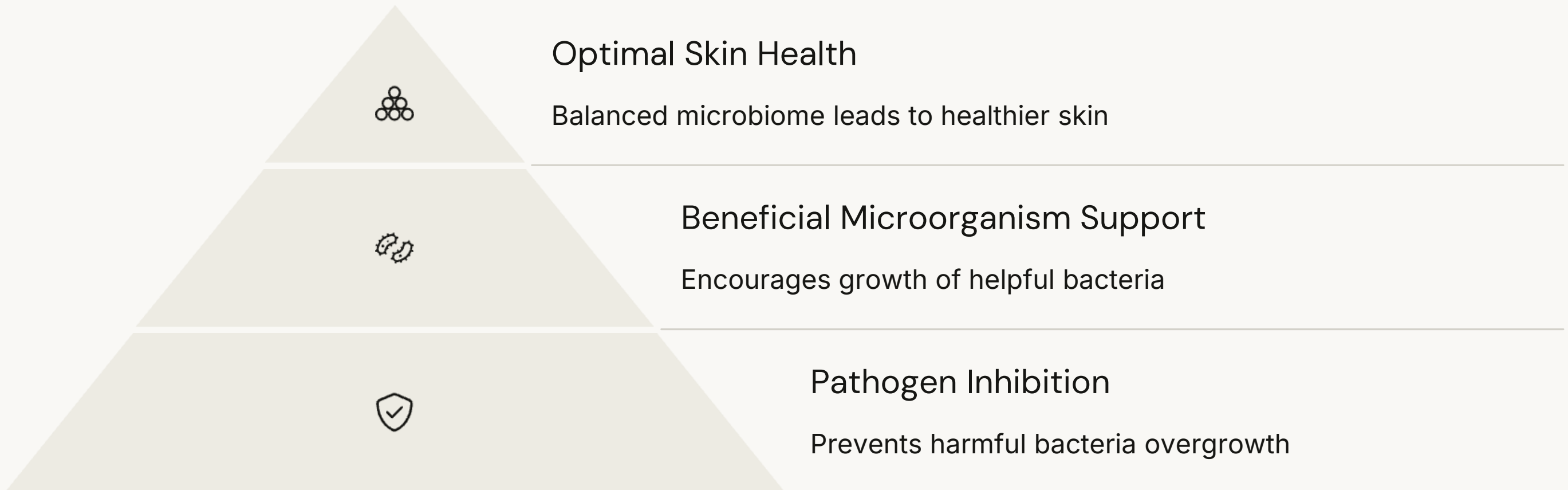
Effective against atopic dermatitis, eczema, and psoriasis

Protect Against Irritants

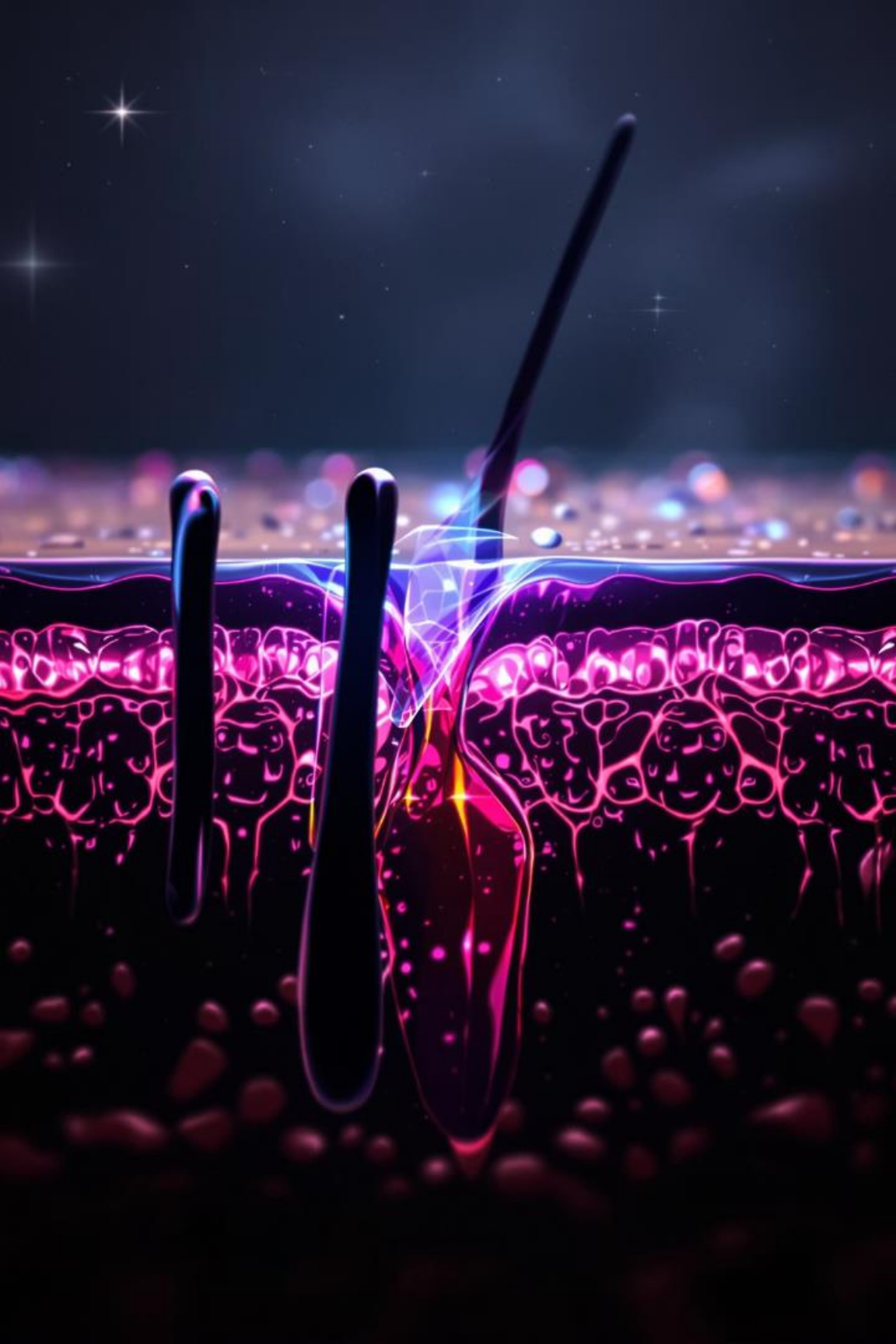
Create a buffer against environmental triggers

According to Silab, products such as Lactobiotyl (a postbiotic product derived from Lactobacillus) effectively modulate the skin's immune response, reducing inflammation and symptoms associated with various skin conditions.

Microbial Balance Regulation



Postbiotics help regulate the skin's microbiome, which plays a critical role in maintaining overall skin health. By promoting beneficial microorganisms, they prevent the overgrowth of harmful bacteria like *Staphylococcus aureus*, which can lead to skin infections and acne outbreaks.



Skin Barrier Enhancement



Strengthen Structure

Reinforce cellular connections



Retain Moisture

Prevent transepidermal water loss



Protect from Stressors

Buffer against environmental damage



Support Repair

Accelerate barrier recovery

As described in Face the Future, postbiotics are shown to strengthen the skin's natural barrier, which is essential for maintaining healthy skin and preventing moisture loss, especially in sensitive or aging skin.

Anti-aging Applications



Reduce oxidative stress

Neutralize free radicals



Enhance collagen production

Improve skin elasticity



Repair and regenerate cells

Reverse visible aging signs

Postbiotics play an essential role in anti-aging skincare by reducing oxidative stress and controlling inflammation, both central to the skin aging process. According to Silab, postbiotics help repair and regenerate skin cells, making them ideal for anti-aging formulations.

Aurelia Probiotic Skincare uses postbiotics from *Lactobacillus* to rejuvenate the skin, stimulate collagen production, and fight signs of aging such as wrinkles and loss of skin elasticity.



Acne Treatment Solutions



Suppress *C. acnes*

Inhibit growth of acne-causing bacteria without disrupting beneficial microbes



Reduce Inflammation

Calm redness and swelling associated with acne breakouts



Regulate Sebum

Help normalize oil production to prevent clogged pores



Accelerate Healing

Speed recovery of damaged skin tissue after breakouts

Gallinée offers postbiotic-rich products like cleansers and moisturizers that restore microbial balance, calm inflammation, and effectively reduce acne flare-ups. These formulations work by addressing multiple factors that contribute to acne development.



Moisturizers and Hydration

28%

Increased Hydration

Average improvement in skin moisture levels
after four weeks of postbiotic moisturizer
use

35%

Barrier Strength

Enhancement in skin barrier function
measured by reduced transepidermal water
loss

42%

Ceramide Production

Increase in natural ceramide levels, essential
for moisture retention

Postbiotics enhance the skin's natural hydration mechanisms by strengthening the epidermal barrier. Their ability to promote ceramide production and reduce water loss is beneficial for dry, sensitive, or aging skin. La Roche-Posay incorporates postbiotics in their sensitive skin range to restore moisture and protect from environmental stressors.

LACTOBIOTYL®: Advanced Postbiotic Active

Bioguided Fermentation

Obtained through specialized fermentation of *Lactobacillus arizonensis*, a microorganism adapted to dry desert environments

Barrier Enhancement

Enhances skin barrier integrity by boosting protein and lipid cohesion markers

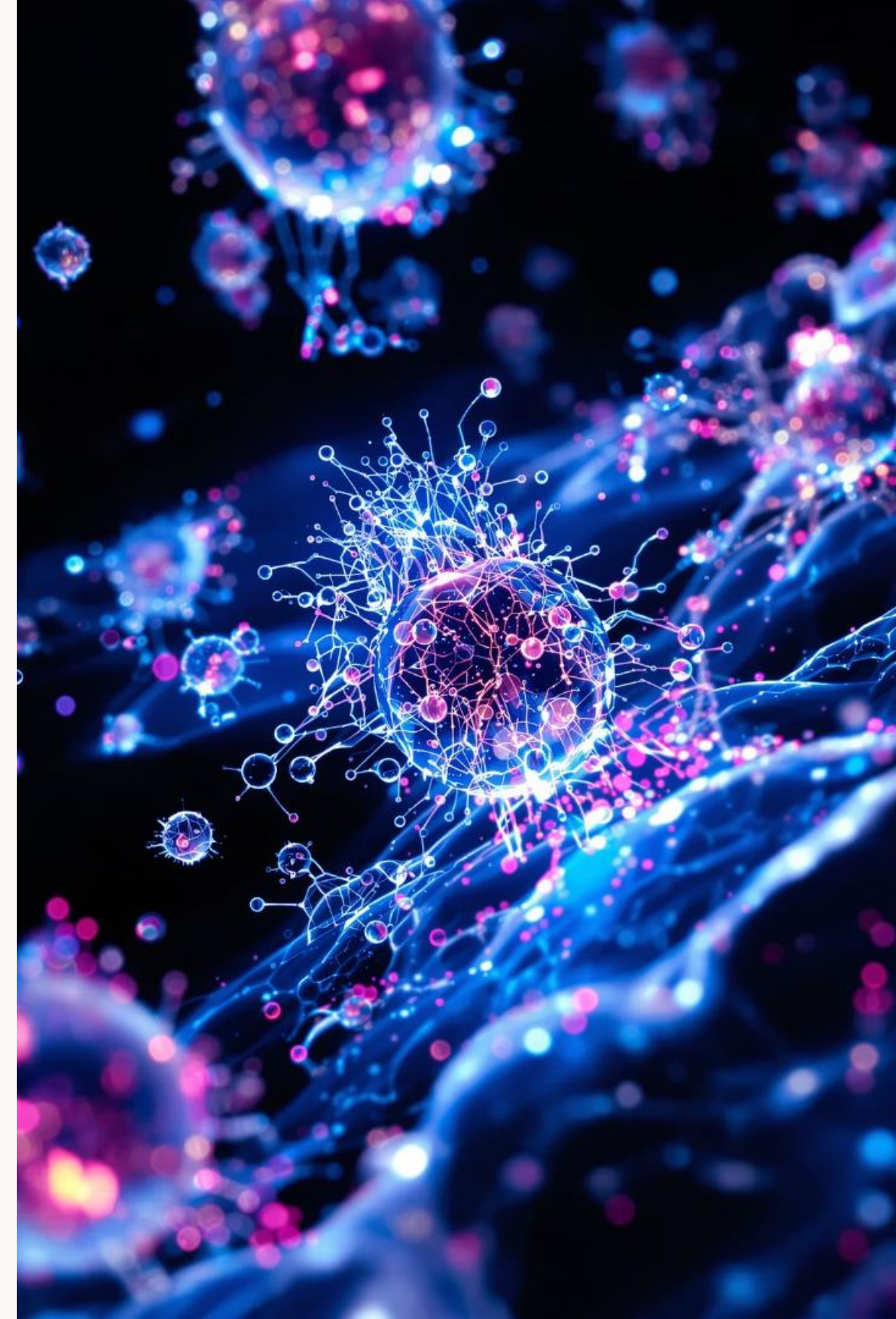
Epidermal Renewal

Stimulates skin cell renewal and maintains balanced cutaneous microbiota

Clinical Validation

Tested on Caucasian and Asian volunteers, showing restored hydration and luminosity to face and hands

LACTOBIOTYL® by Silab is specially designed to target dry skin, making it a highly effective solution for skin dryness and dullness. Its desert-adapted origins make it particularly potent for addressing moisture-related skin concerns.



Eczema and Dermatitis Treatment



Postbiotics are particularly effective for individuals with atopic dermatitis and eczema due to their anti-inflammatory and immunomodulatory effects. They work by reducing skin irritation, itching, and dryness while also restoring balance to the skin microbiome.

EpiGen 3D offers postbiotic-based emollients designed to treat eczema and dry skin, providing immediate relief from irritation and inflammation while promoting long-term skin barrier health.



Sun Protection and Antioxidant Benefits



UV Exposure

Skin encounters harmful ultraviolet radiation, generating free radicals



Postbiotic Protection

Antioxidant properties neutralize free radicals before they can damage skin cells



Cellular Repair

Bioactive compounds support DNA repair mechanisms and reduce inflammation



Long-term Prevention

Regular use helps prevent premature aging and reduces skin cancer risk

Epigen 3D Sun Defense incorporates postbiotics that enhance the skin's defense mechanisms, offering antioxidant protection and reducing skin damage caused by environmental pollutants and UV radiation.

Integration Challenges



Standardization Issues

Due to the variation in the potency of active postbiotics, standardization is needed to ensure consistent formulation. Manufacturers must develop reliable methods to measure and maintain uniform concentrations of active compounds.



Regulatory Considerations

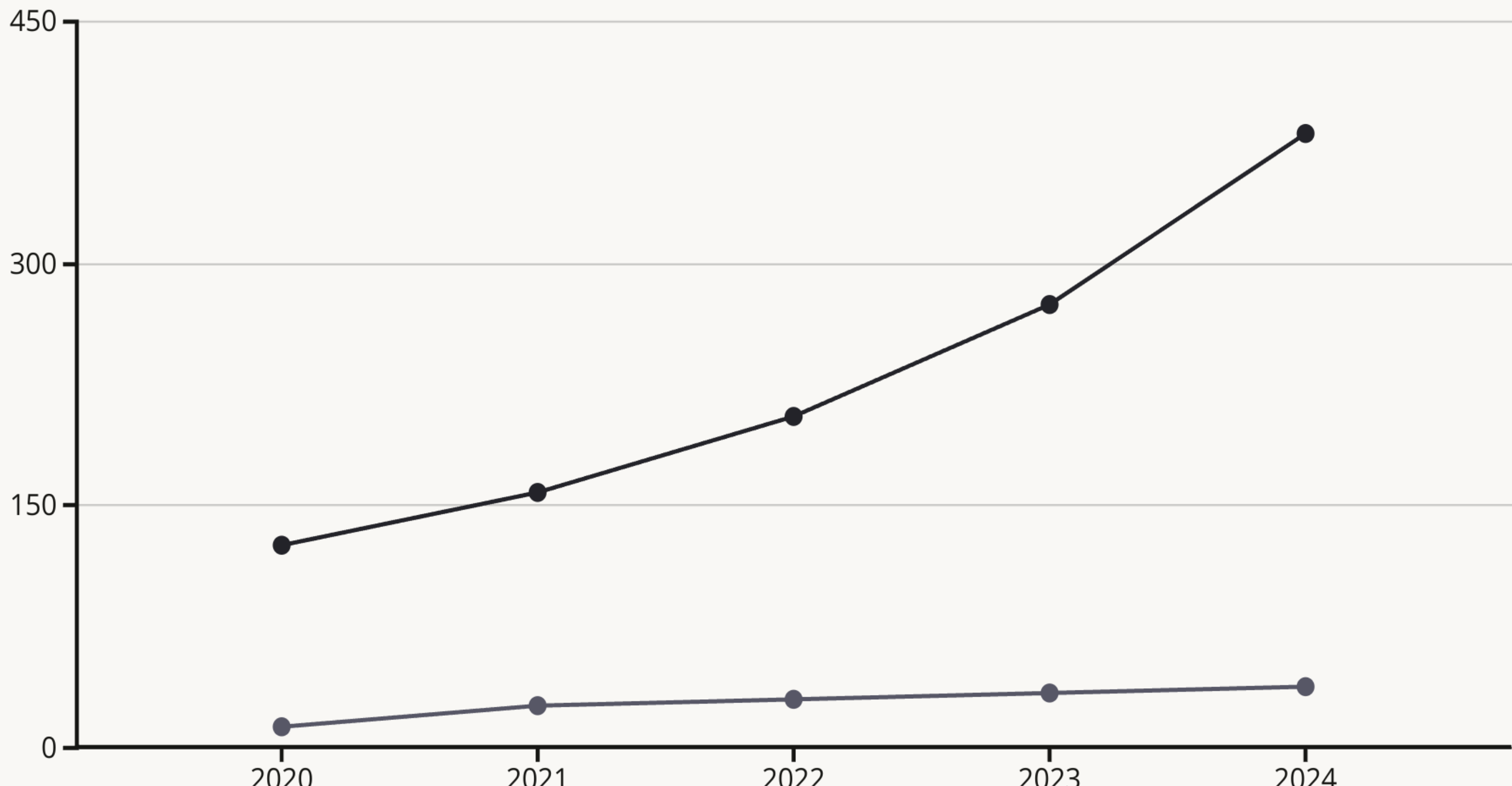
Postbiotics are relatively new in cosmetics, and regulatory frameworks for their safety and efficacy are still being developed. Manufacturers must ensure compliance with regional cosmetic regulations and prove the safety and effectiveness of their formulations.



Cost and Scalability

Producing postbiotics through fermentation processes can be costly, which could affect their affordability. Scaling up production to meet growing consumer demand remains a significant challenge for manufacturers.

Market Growth and Consumer Trends



Leading Postbiotic Skincare Brands

Gallinée

Focuses on microbiome-friendly skincare, using postbiotics in cleansers and moisturizers

EpiCor® by Cargill

Known for immune-boosting properties, used in dermatological treatments to improve skin health



Aurelia Probiotic Skincare

Integrates postbiotics into anti-aging and skin regeneration products

La Roche-Posay

Offers sensitive skin solutions using postbiotics for skin hydration and protection

Epigen 3D

Provides eczema treatment and anti-inflammatory skincare products using postbiotics



Consumer Education and Marketing

Marketing Challenge	Effective Strategy	Expected Outcome
Low consumer awareness	Educational content about microbiome science	Increased understanding and interest
Confusion with probiotics	Clear differentiation in marketing materials	Better product selection by consumers
Scientific complexity	Simplified visuals and analogies	Improved comprehension of benefits
Skepticism about efficacy	Before/after imagery and clinical data	Higher consumer confidence

As postbiotics are still relatively new to many consumers, brands must invest in educational marketing that clearly explains their benefits and differentiates them from probiotics. Clinical studies and scientific backing are particularly important for establishing credibility in this emerging category.

Future Research Directions



Strain-Specific Benefits

Identifying which bacterial strains produce the most effective postbiotics for specific skin conditions and concerns



Delivery Systems

Developing advanced encapsulation and delivery technologies to enhance stability and efficacy of postbiotic compounds



Synergistic Formulations

Exploring how postbiotics interact with other active ingredients to create enhanced benefits through complementary mechanisms



Personalized Solutions

Creating customized postbiotic formulations based on individual microbiome profiles and specific skin needs



Sustainability Aspects



Production Efficiency

Modern fermentation processes for postbiotics can be designed to use fewer resources than traditional cosmetic ingredient production. Companies are investing in closed-loop systems that minimize waste and energy consumption.



Eco-Friendly Packaging

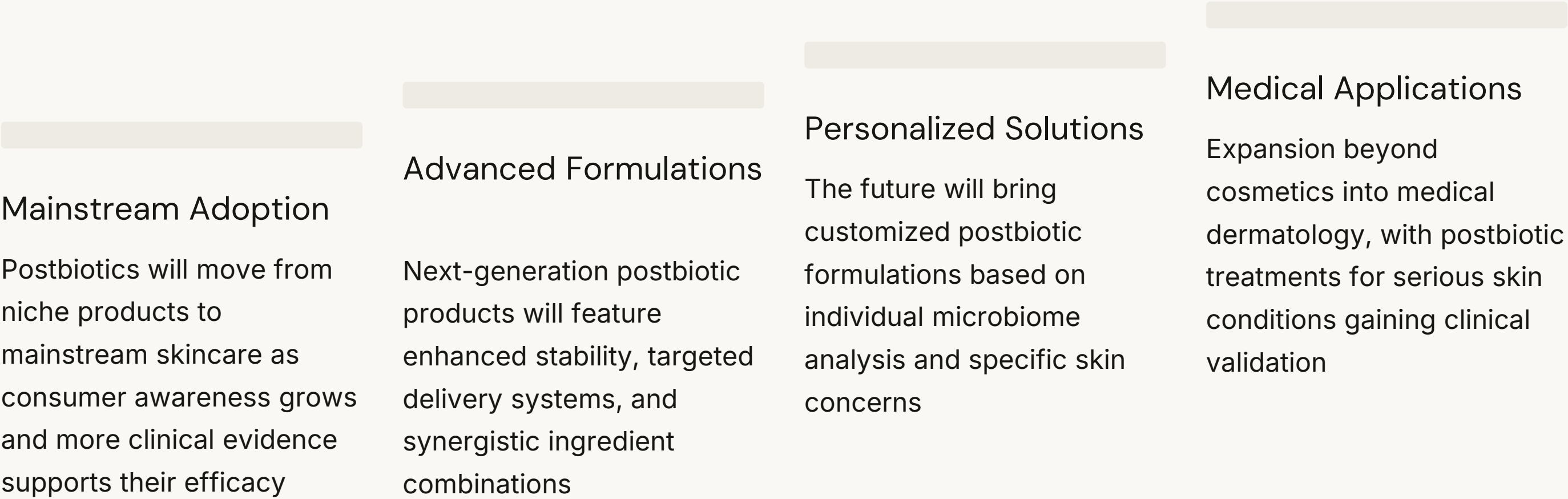
Many postbiotic skincare brands are embracing sustainable packaging solutions, including recyclable materials, refillable containers, and biodegradable options that align with environmentally conscious consumer values.



Natural Sourcing

The trend toward plant-based and naturally derived postbiotics is growing, with companies developing fermentation processes using sustainable botanical ingredients rather than synthetic or animal-derived substrates.

The Future of Postbiotics in Skincare



Postbiotics are set to revolutionize the skincare and cosmetics industry due to their ability to enhance skin health, address inflammatory conditions, and promote skin regeneration. Their non-viable nature, combined with proven benefits for the skin's microbiome, makes them an appealing alternative to live probiotics.

ساناریا :راه حل جامع اصلاح میکروبیوم پوست



پست بیوتیک‌ها : جایگزین کورتون در درمان اگزما



کاهش التهاب



این ترکیبات با کاهش التهاب، جایگزین مناسبی برای کورتون‌ها هستند.

تقویت سد دفاعی پوست



پست بیوتیک‌ها با تقویت سد دفاعی پوست، از آسیب‌های محیطی جلوگیری می‌کنند.

حفظ رطوبت



پست بیوتیک‌ها با حفظ رطوبت پوست، به درمان خشکی ناشی از اگزما کمک می‌کنند.

کاربردهای پست بیوتیک در مراقبت پوست

آسیب آفتاب

ترمیم آسیب‌های ناشی از اشعه UV



پوست حساس

مناسب برای پوست‌های حساس و آسیب‌پذیر



اگزما و پسوریازیس

کاهش التهاب و خارش در بیماری‌های پوستی

ضد پیری

کاهش چین و چروک و افزایش شادابی

آب رسان‌های فوق قوی برای پوست

ترکیبات منحصربه‌فرد

پست بیوتیک‌ها با ترکیبات خاص، آبرسانی فوق‌العاده‌ای به پوست می‌دهند.



تقویت سد پوستی

این محصولات با تقویت سد پوستی، از اتلاف رطوبت جلوگیری می‌کنند.

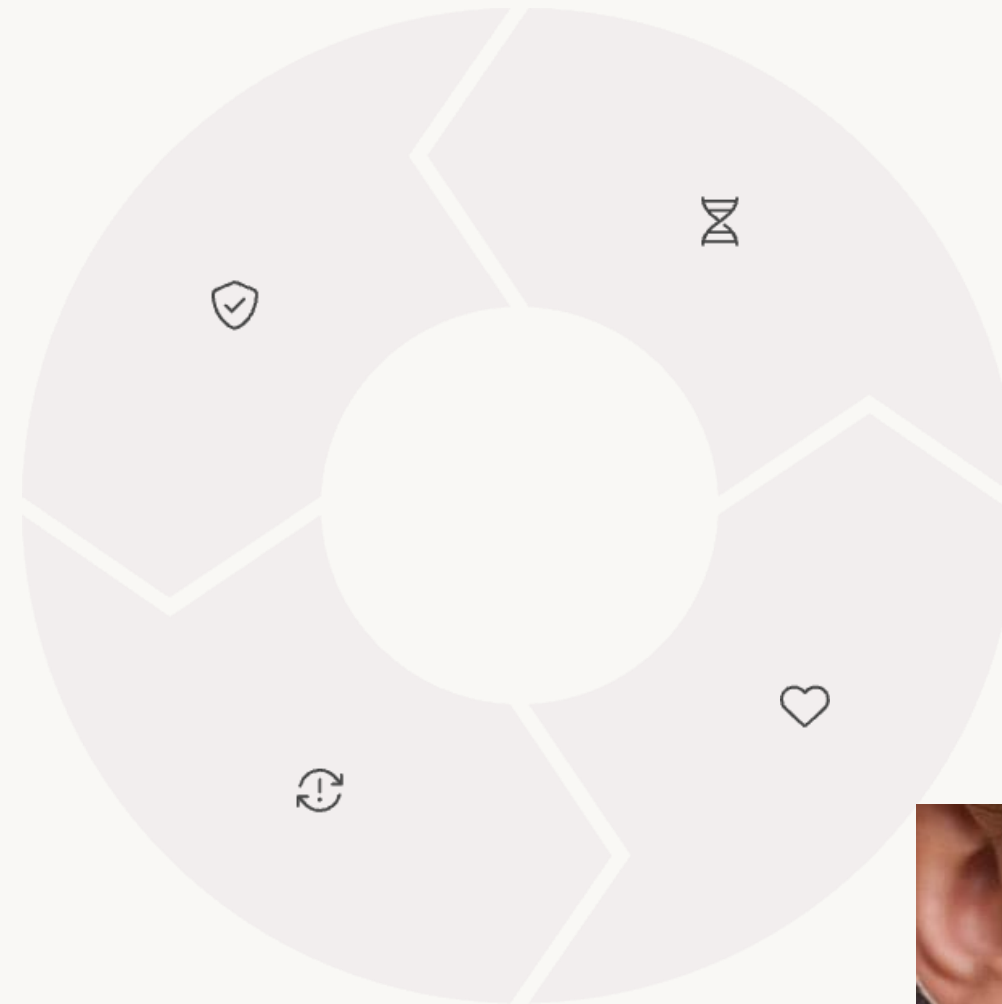


کاهش التهاب

پست بیوتیک‌ها التهاب ناشی از آگزما و اختلالات پوستی را کاهش می‌دهند.



کلاژن سازی و جوان‌کنندگی پوست



تحریک تولید کلاژن

پست بیوتیک‌ها با تحریک تولید کلاژن و الاستین، به جوان‌سازی پوست کمک می‌کنند.

تقویت اثرات ضدپیری

ترکیب با هیالورونیک اسید و آنتی‌اکسیدان‌ها، اثرات ضدپیری را تقویت می‌کند.

خنثی‌سازی رادیکال‌های آزاد

این ترکیبات با خنثی‌سازی رادیکال‌های آزاد، فرآیند پیری را کند می‌کنند.

ترمیم آسیب‌های محیطی

پست بیوتیک‌ها آسیب‌های ناشی از UV و آلودگی را ترمیم می‌کنند.



Sunarya
Health Products

روش جدید درمان آکنه

مقابله با باکتری‌های مضر



مهار رشد *Cutibacterium acnes* با متابولیت‌های ضد میکروبی

کاهش التهاب



کاهش قرمزی و التهاب ناشی از آکنه

تنظیم میکروبیوم پوست



ایجاد تعادل در فلور میکروبی پوست

ترمیم بافت پوست با پست بیوتیک‌ها



مکانیسم عمل پست بیوتیک‌ها

تولید متابولیت‌های فعال



پپتیدها، اسیدهای چرب کوتاه‌زنجیر و آنزیم‌های مفید توسط باکتری‌های پروبیوتیک تولید می‌شوند.

تنظیم میکروبیوم پوست



ایجاد تعادل در جمعیت میکروبی پوست و مهار رشد باکتری‌های مضر.

تقویت سد دفاعی

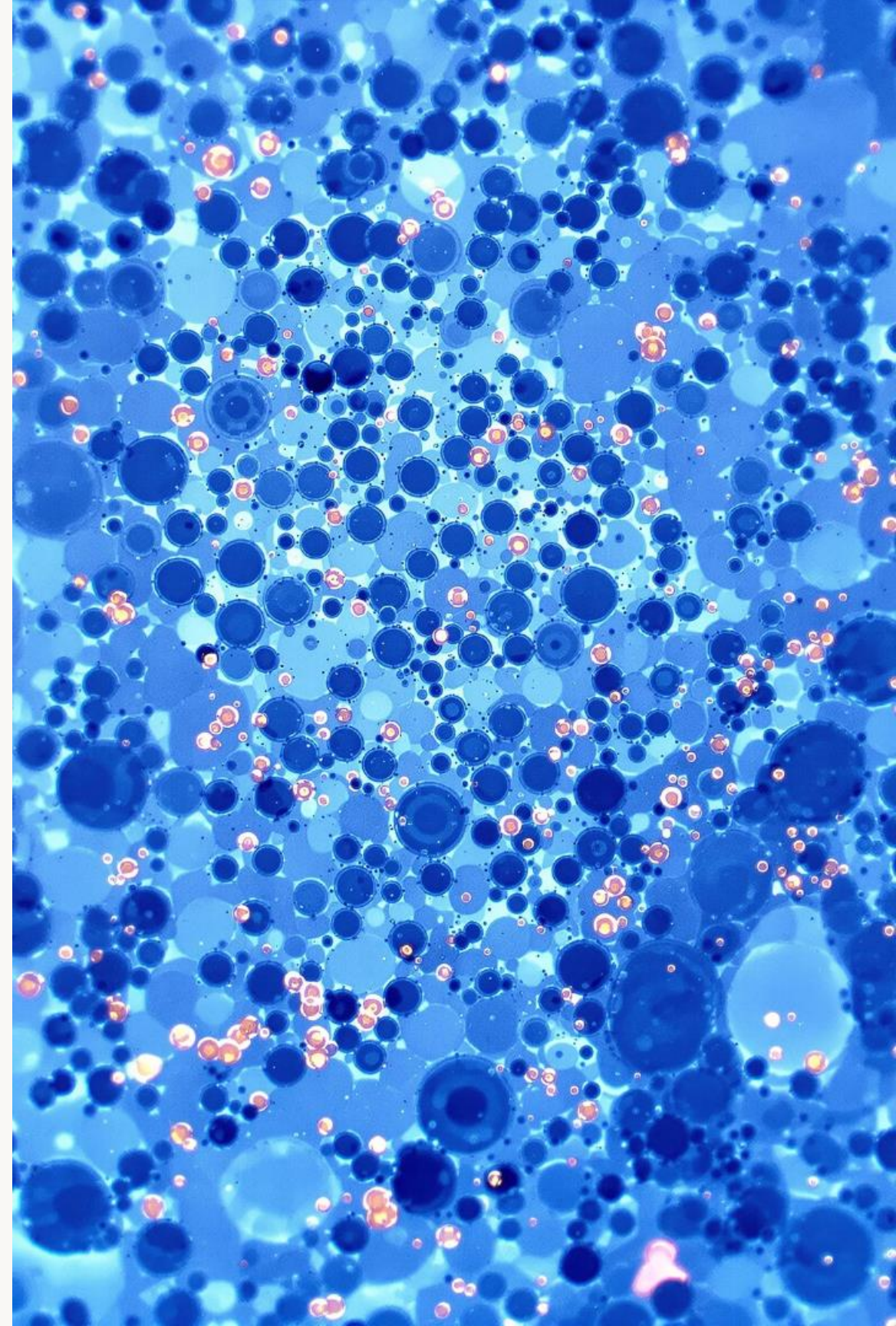


بهبود عملکرد لایه شاخی و افزایش مقاومت پوست در برابر عوامل خارجی.

فعال‌سازی مسیرهای ترمیمی



تحریک سلول‌های پوست برای ترمیم و بازسازی بافت آسیب‌دیده.



مقایسه پست بیوتیک با سایر درمان‌ها

آنتی بیوتیک‌ها

- احتمال مقاومت میکروبی
- برهم زدن تعادل میکروبیوم
- فقط اثر ضد میکروبی
- خشکی و تحریک پوست

کورتیکواستروئیدها

- عوارض جانبی در استفاده طولانی مدت
- نازک شدن پوست
- فقط اثر ضدالتهابی
- محدودیت در مدت استفاده

پست بیوتیک‌ها

- ایمن و کم عارضه
- تقویت میکروبیوم طبیعی پوست
- اثرات چندگانه (ضدالتهاب، ترمیمی، آبرسان)
- مناسب برای استفاده طولانی مدت