

# Beauty and Wellness: The Microbiome Connection

Paula Simpson, Founder  
Nutribloom Consulting Group





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The skin microbiome has a crucial function for human health. The diet you consume, the hygiene habits you choose, the products you apply, and your lifestyle all influence it.

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Dr. Chris Callewaert (Ghent University, Center for Microbial Ecology and Technology)

# Why Biome Beauty?

Market Analytics

**\$26.5B**

Global skin microbiome market  
by 2035

CAGR ~8% (2025-2035)

**\$8.4B**

Beauty supplements by 2034

CAGR 11.7% (gut-skin driven)

Sources: Market Research Future 2026, Grand View Research 2025, Research and Markets 2024



# Why Biome Beauty?

## Market Analytics

### Consumer Demands/Lifestyle

- **Gentle on Skin** – 47% of launches are paraben/sulfate-free, microbiome-safe formulations
- **Scientific validation** – Clinical research proving microbiome's role in skin barrier function and inflammation control
- **Natural ingredient preference** – Strong consumer shift toward probiotics, prebiotics, postbiotics vs. harsh chemicals
- **Millennial & Gen Z adoption** – Younger demographics driving transparent, health-conscious beauty choices

### Clinical Benefits Driving Adoption:

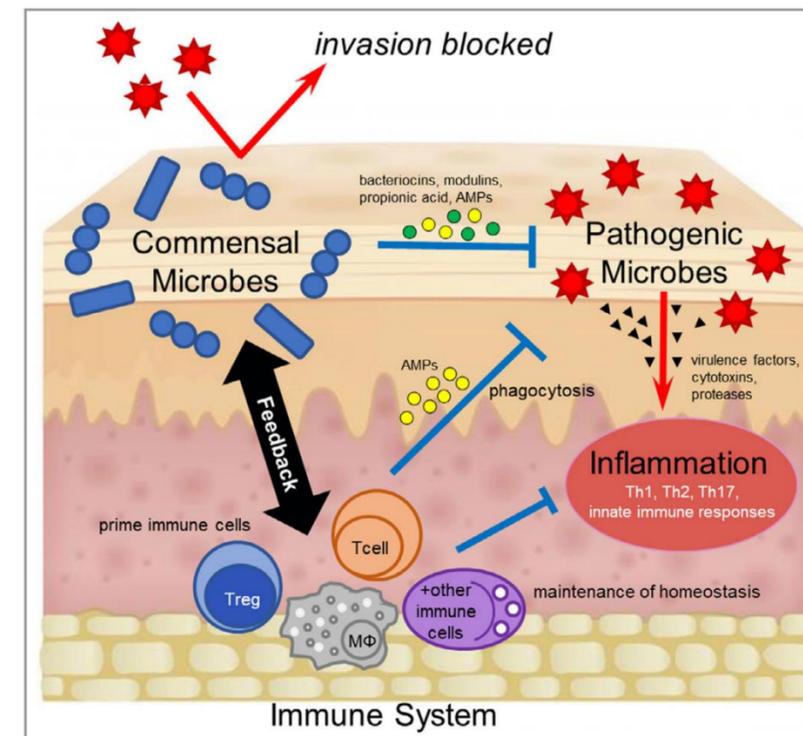
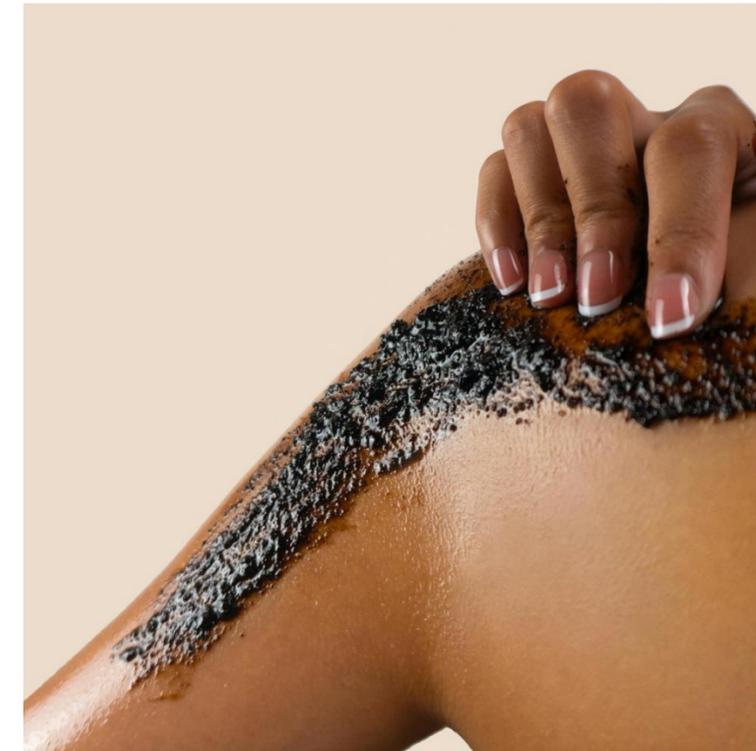
- **Barrier strengthening** – Beneficial bacteria produce ceramides, fatty acids for moisture retention
- **Inflammation reduction** – Microbiome balance calms acne, eczema, rosacea conditions
- **Skin condition management** – Growing urban skin issues (pollution-exposed populations) seeking microbiome solutions



# Skin Microbiota

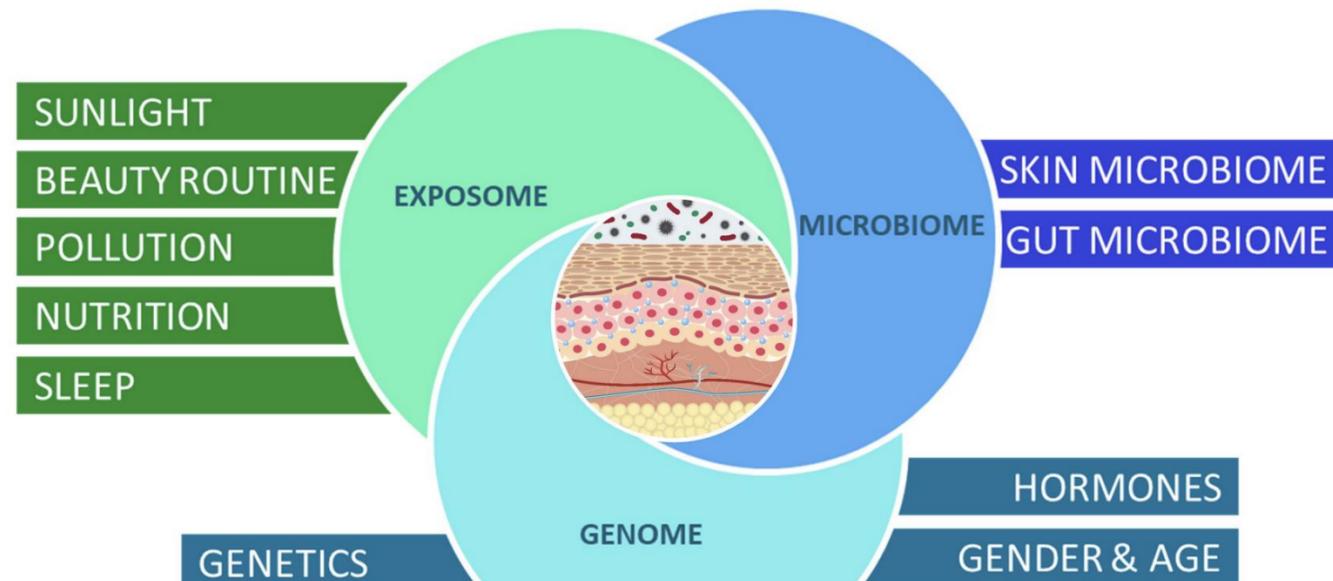
Human skin hosts over 1,000 mostly harmless commensal bacterial species that reside on the skin barrier and within its microenvironments. These microbes help maintain skin health by occupying niches that might otherwise be taken by pathogens, secreting antimicrobial compounds, and modulating immune responses to enhance defense or promote tolerance and reduce inflammation.

Beneficial bacteria defend skin by blocking pathogen colonization, secreting natural antimicrobials (AMPs, propionic acid), and training immune cells to recognize threats. Simultaneously, they activate regulatory T cells to balance inflammatory responses, preventing excessive immune reactions that worsen skin conditions.

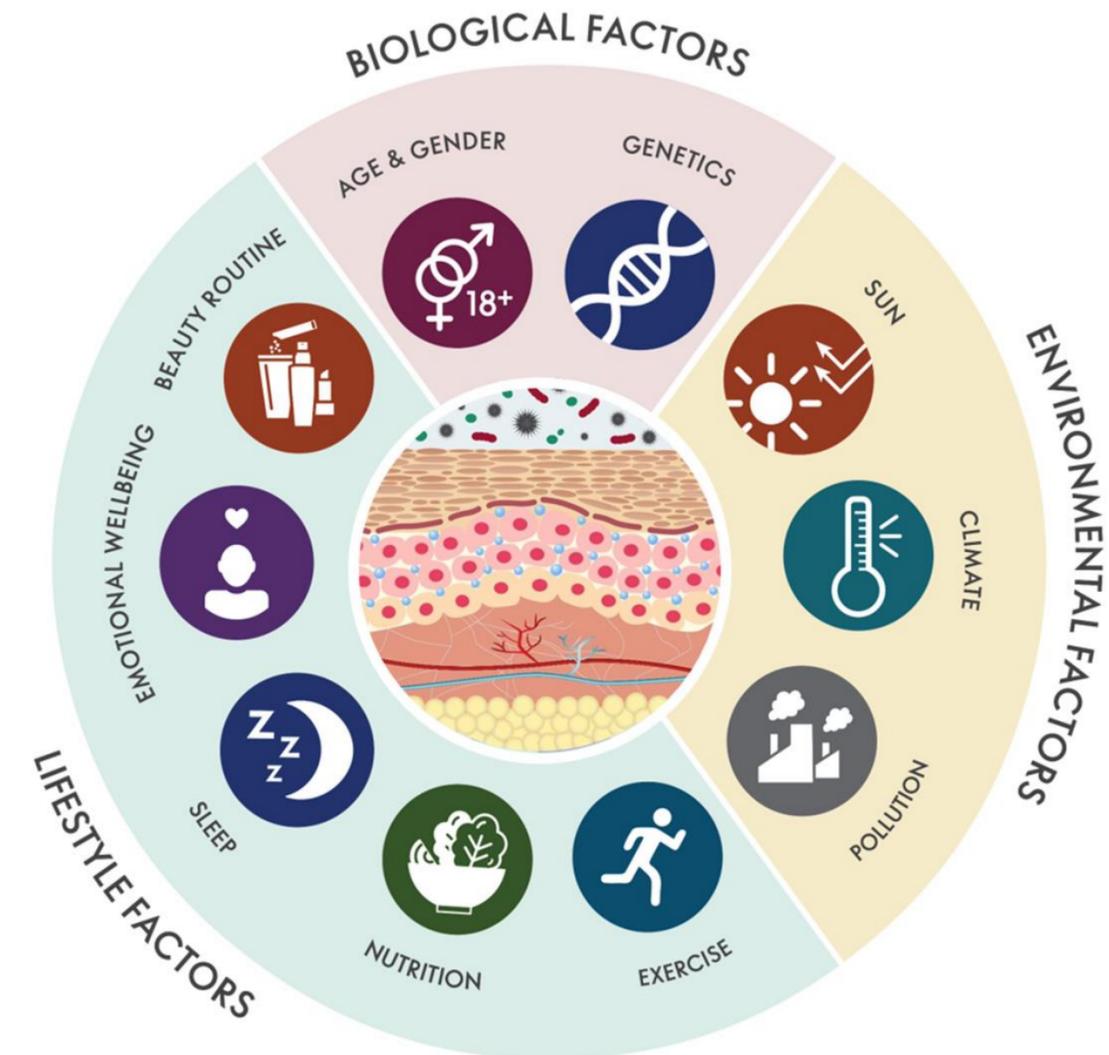


# Skin Interactome

HOLISTIC PERSPECTIVE FOR SKIN HEALTH & AGING



1. Sun
2. Pollution
3. **Stress**
4. Cosmetics
5. **Nutrition**
6. **Sleep**



Khmaladze, et al., *Clinical Cosmetic & Investigative Dermatology* (2020); Li C et al. *Biomedicines* (2025); Xia J et al. *Dermatologic Therapy* (2025)



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The term **'gut health'** is increasingly used as a catch-all phrase by many to describe a wide range of health-related concepts. Despite its widespread use, particularly in relation to studies on diet, fermented foods, bionics and the gut microbiome, it remains unclear what the term gut health means.

**The structure and function of the gut microbiome changes radically with age**, as exemplified by taxa such as Bifidobacterium that are dominant in infancy and youth and become rare in older individuals. Furthermore, these age-microbiome interactions differ by global geography, such that associations between microbiome uniqueness and healthy ageing are different in different continents.

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Marco, M.L., *et al.* The International Scientific Association for Probiotics and Prebiotics (ISAPP) consensus statement on the definition and scope of gut health. *Nat Rev Gastroenterol Hepatol* (2026).



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The **gut-skin axis** is a microbiota-driven control panel where intestinal microbes tune systemic immunity, barrier strength, and when in dysbiosis, can reveal skin diseases on the surface.

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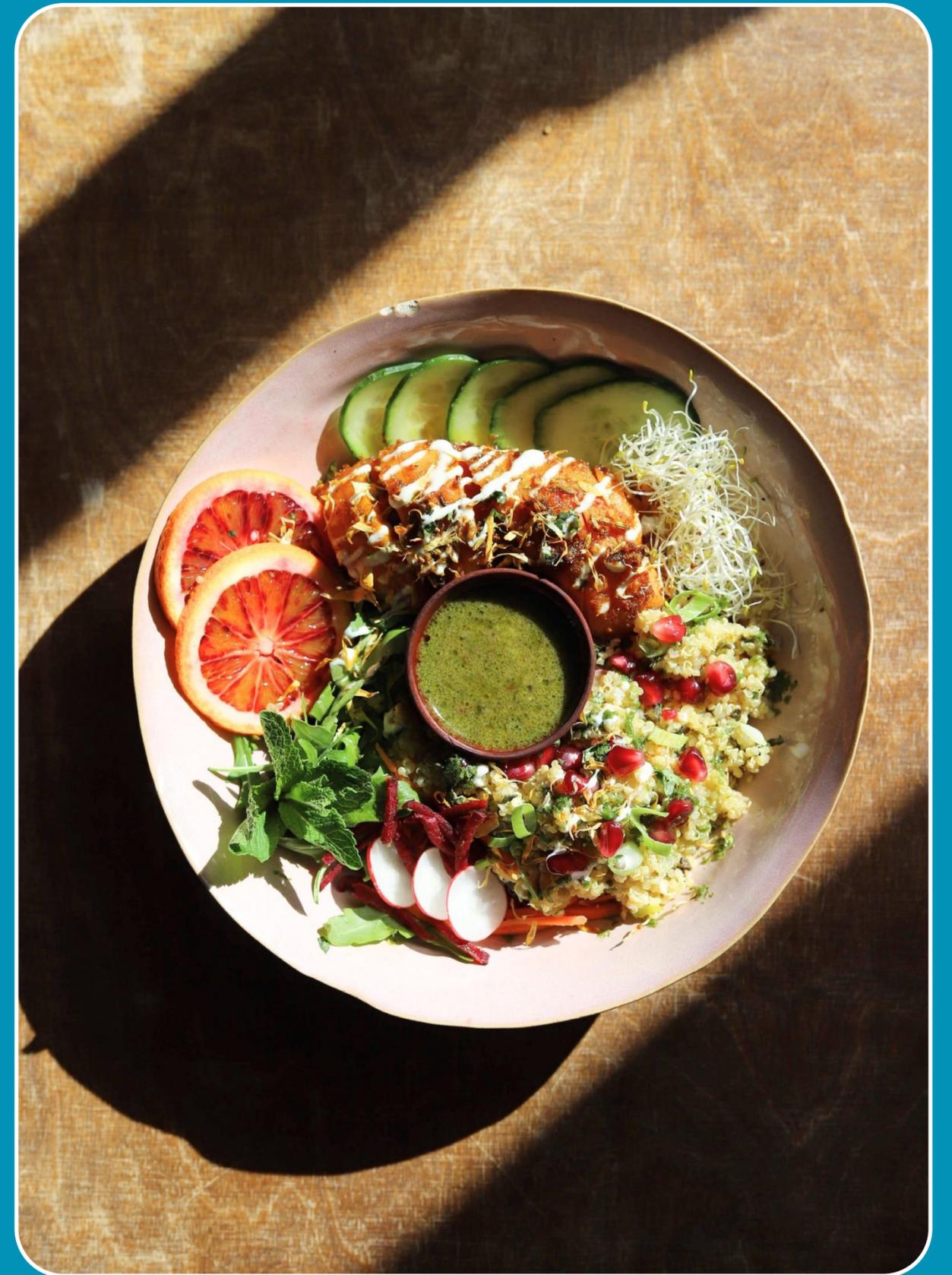
Jimenez-Sanchez M et al. *Gut Microbes* 2025;17(1):2473524

# The Gut-Skin (Brain) Axis

"Diet is recognized as a major factor influencing the composition and function of the gut microbiota, with plant-rich patterns favoring anti-inflammatory commensals and Western diets driving dysbiosis and systemic inflammation."

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Bolte LA et al. Gut 2021;70(7):1287-1298.



# Mechanistic Science

## Nutrition -> Gut Microbiome & Inflammation

Metagenomic study of 1,425 people (IBD, IBS, and healthy controls) showed that long-term dietary patterns consistently shape gut microbes and their inflammatory potential.

Diets rich in legumes, whole grains, nuts, oily fish, fruits, vegetables, plant protein, and moderate red wine favored SCFA-producing commensals (for example *Faecalibacterium*, *Roseburia*), lower fecal calprotectin, and anti-inflammatory pathways, whereas patterns high in red/processed meat, fast food, sugar-sweetened drinks, total alcohol/spirits, and saturated fat were linked to dysbiosis, endotoxin and pro-inflammatory pathways, depleted *Bifidobacterium*, higher fecal calprotectin, and overgrowth of mucolytic/pathobiont species (for example *Ruminococcus gnavus*, *Clostridium boltea*).

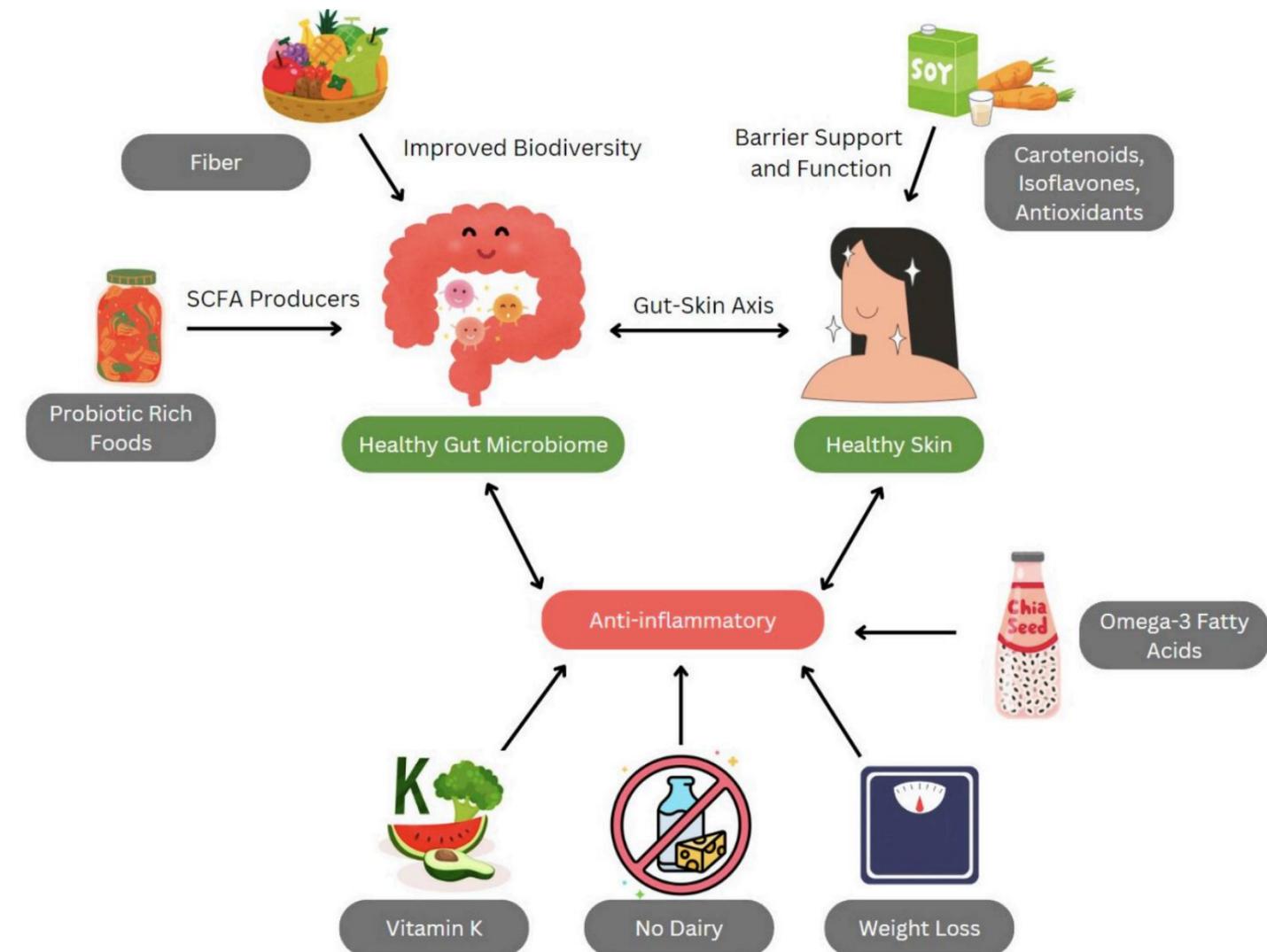
**Table 2** Overview of diet-gut microbiome associations consistent across cohorts in this study and their pro-inflammatory or anti-inflammatory role

| Findings in this study   |   |   | Supporting studies   |  |
|--|---|---|--|--|
| Taxa   | Diet (↑)  | Diet (↓)  | Pro-inflammatory or anti-inflammatory role   | References   |
| <i>Bifidobacterium</i> spp   | Plant protein, carbohydrates, bread, fruit  | Protein, animal protein, fat, fish, savoury snacks, red wine, butter  | SCFA synthesis (acetate); linked to dense mucosal barrier, reduced LPS levels and raised efficacy of cancer immunotherapy; depleted in IBD, IBS, obesity | <a href="#">13</a> <a href="#">15</a> <a href="#">22</a> <a href="#">35</a> <a href="#">41</a> <a href="#">51</a> <a href="#">52</a> |
| <i>Lactococcus lactis</i> , <i>Lactobacillus delbrueckii</i>   | Buttermilk, cluster of fermented dairy  | No negative associations  | SCFA and thiamine synthesis, anti-cancer activities  | <a href="#">13</a> <a href="#">26</a> <a href="#">53</a>   |
| <i>Eubacterium</i> spp   | Plant protein, cereals, fruit, red wine   | Carbohydrates, non-alcoholic drinks, soft drinks                      | SCFA (butyrate) and phenolic acid synthesis; depleted in IBD   | <a href="#">13</a> <a href="#">22</a> <a href="#">35</a>   |
| <i>Roseburia</i> spp   | Fish, nuts, vegetables, plant protein, cereals, tea, legumes, vegetables, fruit                   | Total kcal, sugar, savoury snacks, meat, gravy, sweetened milk drinks | SCFA synthesis (butyrate) and anti-inflammatory effects; depleted in IBD   | <a href="#">13</a> <a href="#">19</a> <a href="#">22</a> <a href="#">54</a>  |
| <i>Faecalibacterium prausnitzii</i>  | Red wine, legumes, fruit, lean beef, fish, nuts, fat  | Carbohydrates soft drinks, sweets, syrup                              | SCFA synthesis (butyrate) and anti-inflammatory effects; depleted in IBD   | <a href="#">13</a> <a href="#">19</a> <a href="#">22</a> <a href="#">35</a> <a href="#">55</a>                                       |
| (phylum) Firmicutes and clusters of <i>Ruminococcus gnavus</i> , <i>Lachnospiraceae</i> bacteria, <i>Clostridium boltea</i> , <i>Coprobacillus</i> | Protein, animal protein, fat intake, cheese cluster of fast food and soft drinks                  | Plant protein, carbohydrates, bread                                   | Enriched in obesity, increased energy harvesting capacity  | <a href="#">19</a> <a href="#">44</a>  |
| <i>Bacteroides fragilis</i>  | Cheese, custard   | Cluster of breads and legumes   | Opportunistic pathogen with increased abundance in IBD and colorectal cancer, raised LPS levels  | <a href="#">22</a> <a href="#">32</a> <a href="#">41</a>   |
| <i>Escherichia coli</i>  | No positive associations in the meta-analysis   | Cluster of breads and legumes   | Increased abundance in IBD and colorectal cancer, raised LPS levels  | <a href="#">18</a> <a href="#">22</a> <a href="#">32</a>   |
| (family) Erysipelotrichaceae   | Animal protein, soft drinks, syrup  | Plant protein   | Pro-inflammatory; associated with colorectal cancer, hypercholesterolaemia, and obesity.   | <a href="#">56</a> <a href="#">57</a>  |
| <i>Streptococcus</i> spp   | Protein, animal protein, fat, cheese, yoghurt drink, custard                                      | Plant protein, nuts   | Increased in IBD, alcoholism, liver cirrhosis, primary sclerosing cholangitis, colon cancer and IMIDs such as MS, ankylosing spondylitis and arthritis   | <a href="#">2</a> <a href="#">22</a> <a href="#">32</a> <a href="#">43</a> <a href="#">58</a>  |
| <i>Blautia</i> spp   | Animal protein, alcohol, meat, cheese, soft drinks, fast food pattern ( <i>R. gnavus</i> cluster) | Plant protein, carbohydrates, fruit, bread                            | Increased in IBD, MS, ankylosing spondylitis and arthritis   | <a href="#">2</a> <a href="#">22</a> <a href="#">42</a>  |

# Mechanistic Science

## Nutrition -> Gut-Skin Axis

Diet strongly shapes gut microbiota composition and function, making dietary patterns central to the gut-skin axis.

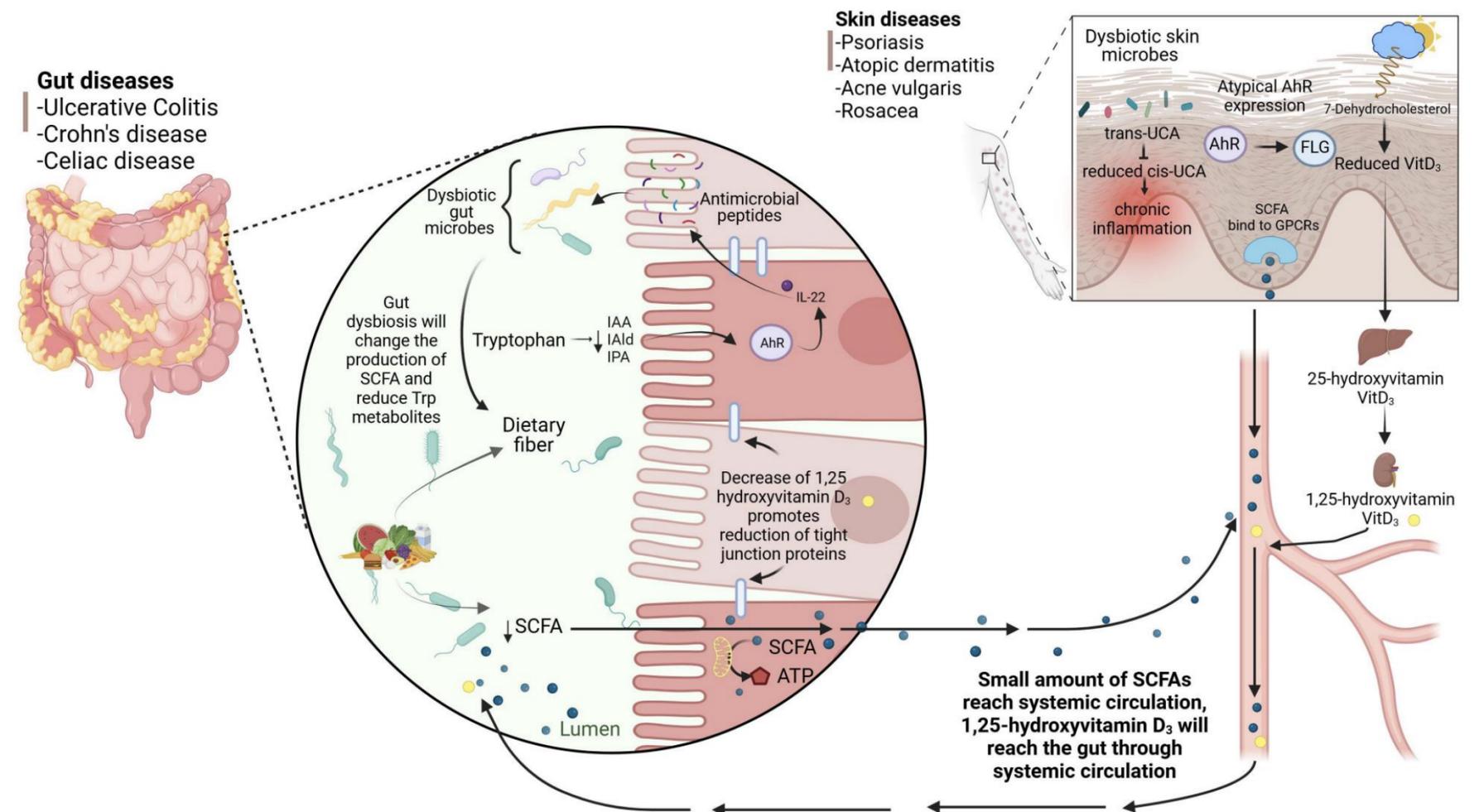


**Figure 2. Proposed mechanisms of a plant-based diet on inflammatory skin diseases.** Plant-based foods are rich in fiber and probiotics which support bacteria that metabolize and produce SCFAs that are key regulators of gut health. Plant-based diets contain vitamin K, eliminate dairy sources, promote weight loss, and improve ratios of omega-3 fatty acids to omega-6 fatty acids, thereby reducing systemic inflammation. Plant-based foods also contain bioactive compounds such as carotenoids, isoflavones, and antioxidants that act on skin barrier support and function. Altogether, these mechanisms lead to a healthier gut microbiome, reduced systemic inflammation, and healthy skin. This figure was created on Canva (Sydney, Australia). Abbreviations: SCFA, short-chain fatty acid.

# Mechanistic Science

## Bio-communicative -> Gut-Skin Axis

Reduced UVB in high latitudes lowers vitamin D and alters gut barrier proteins, SCFA production, and AhR ligands, contributing to dysbiosis in IBD and associated skin inflammation. Skin diseases such as psoriasis, acne, atopic dermatitis, and vitiligo frequently coexist with IBD, where disrupted vitamin D-SCFA-AhR signaling impairs mucosal healing and skin immune tolerance.



# Mechanistic Science

## Gut-Skin Axis

- **Gut-skin axis:** Bidirectional crosstalk via microbial metabolites (SCFAs, bile acids, tryptophan derivatives) influences immunity, oxidative stress, endocrine signaling
- **Dysbiosis impact:** Intestinal permeability and inflammatory mediators aggravate acne, atopic dermatitis, psoriasis, melasma
- **Clinical mechanisms:** *Lactobacillus* and *Bifidobacterium* strains -> mitigate inflammation, enhance gut tight-junctions, elevate ceramides and hyaluronic acid
- **Diet/Nutraceuticals:** restore/balance, ↓TEWL, ↓ inflammation, support immunity, protect/strengthen

Gao et al. *Nutrients* 2023; Vaughn et al. *Cell Rep* 2022; Jimenez-Sanchez M et al. *Gut Microbes* 2025



# Mechanistic Science

## Probiotics-Nutraceuticals-Skin

Across 60 RCTs, microbiome-targeted nutraceuticals generally **improved atopic dermatitis and psoriasis severity scores (SCORAD, PASI) and quality of life.**

Interventions enhanced gut barrier integrity, increased SCFA production, and shifted gut microbiota toward more diverse, “eubiotic” profiles, which correlated with reductions in inflammatory cytokines.

Supplements act as dietary components: fermentable fibers and live microbes serving as substrates or catalysts that modify the gut ecosystem, illustrating how targeted “diet-like” inputs can influence systemic and cutaneous immune responses.

Evidence was strongest and most consistent for atopic dermatitis, more mixed for psoriasis, and sparse/inconclusive for acne, highlighting that diet-microbiome strategies are condition-specific and not universally effective yet.

Interventions with probiotics and pre-/synbiotics showed the most consistent evidence for skin health benefits, particularly for atopic dermatitis and psoriasis. These interventions often improved skin barrier function, reduced inflammation, and modulated immune responses.

Future research should focus on identifying the most effective probiotic and pre-/synbiotic formulations, understanding the underlying mechanisms of action, and exploring personalized approaches based on individual microbiome profiles and skin conditions.

| Indication             | Probiotics   | Pre-/Synbiotics   | Main outcomes                                 |
|------------------------|--|---|---|
| Atopic dermatitis (AD) | <i>L. rhamnosus</i> , <i>L. paracasei</i> , <i>B. breve</i> , <i>B. longum</i> | Synbiotics: Lactobacillus/Bifidobacterium mixes + FOS/GOS | ↓ SCORAD, fewer flares, better QoL            |
| Psoriasis              | Multi-strain <i>Lactobacillus</i> + <i>Bifidobacterium</i>                     | Synbiotics with inulin/FOS in some trials                 | ↓ PASI, improved inflammatory markers         |
| Acne                   | <i>L. rhamnosus</i> , <i>L. reuteri</i> , <i>B. lactis</i>                     | Limited synbiotic use                                     | ↓ lesion counts, ↓ sebum/inflammatory markers |
| Melasma /Pigmentation  | <i>L. plantarum</i> , <i>B. longum</i> (often multi-strain formulas)           | Not consistently reported                                 | ↓ pigment scores, improved brightness         |
| Chronic urticaria      | <i>L. rhamnosus</i> , <i>B. lactis</i> (varied combinations)                   | Occasional synbiotics with FOS/GOS                        | ↓ hive frequency, symptom relief              |

# Mechanistic Science

## Microbiome-Nutraceuticals-Skin

| Intervention (oral)                                       | Population & Design                           | Main Skin Outcomes   | Microbiome-Relevant Mechanism   | Reference                         |
|---|---|--|---|-----------------------------------|
| Multi-strain probiotic + doxycycline vs doxycycline alone | Acne patients, randomized double-blind trial  | Greater reduction in lesion scores on forehead, chin, nose; improved global acne grading                     | Gut microbiota modulation reduces systemic inflammation and sebum-related pathways            | Atefi 2025 (J Cosmet Dermatol)    |
| Probiotic "well-aging" supplement                         | 66 adults, DB-RCT, 56 days + 28-day follow-up | ↓ wrinkle depth (-15%), ↓ roughness, ↑ dermal thickness/density, ↑ hydration, ↓ TEWL, ↑ antioxidant capacity | Gut-skin axis: SCFA and immune modulation improve barrier, oxidative stress and dermal matrix | Gao 2023 (Nutrients)              |
| <i>L. plantarum</i> HY7714                                | Adults, DB-RCT                                | Improved hydration, reduced photoaging markers   | Enhanced intestinal barrier, reduced endotoxemia, altered cytokine profile benefiting skin    | Lee 2015 (J Microbiol Biotechnol) |
| <i>B. breve</i> M-16V                                     | Adult females, DB-RCT                         | Suppressed increase in brown spots and other facial deterioration  | Shifts in gut and skin microbiota; reduced oxidative and inflammatory signaling               | Nishikawa 2025 (Nutrients)        |
| Rice-derived ceramide supplement                          | Adults, 4-week clinical trial                 | ↑ hydration, ↓ TEWL, fewer fine lines, better radiance   | Restores stratum corneum ceramides, reduces barrier-driven inflammation impacting microbiome  | Leo TK 2022 (Nutrients)           |

# Mechanistic Science

## Probiotic regulation on skin via gut-skin axis

### Oxidative Stress ↓

Specific *Lactobacillus/Bifidobacterium* strains and probiotic-fermented plants reduce UV-driven ROS, inhibit MMPs, and boost procollagen to limit photoaging

### Inflammation ↓

Oral *B. breve*, *L. acidophilus*, *L. reuteri* and SCFA-producing *S. epidermidis* reduce UV-driven cytokines, erythema and TEWL, preserving barrier function

### Immune Homeostasis

*L. paracasei*, *L. johnsonii* and *B. longum* + GOS boost Tregs, SCFAs and Langerhans recovery, maintaining skin immune tolerance after UV

### Extracellular Matrix

*L. acidophilus* KCCM12625, *L. plantarum* HY7714, *L. sakei* and Lactobacillus exopolysaccharides down-regulate AP-1/MAPK, lower MMPs/elastase, and boost procollagen/TIMPs to preserve collagen and elastin



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**Prebiotics** are an often overlooked and “far reaching” strategy, particularly for people with a history of dysbiosis or subpar gut health. Prebiotic fibers and polyphenol glycosides are being formulated to “seed” gut microbiota that influence skin via gut-skin axis.

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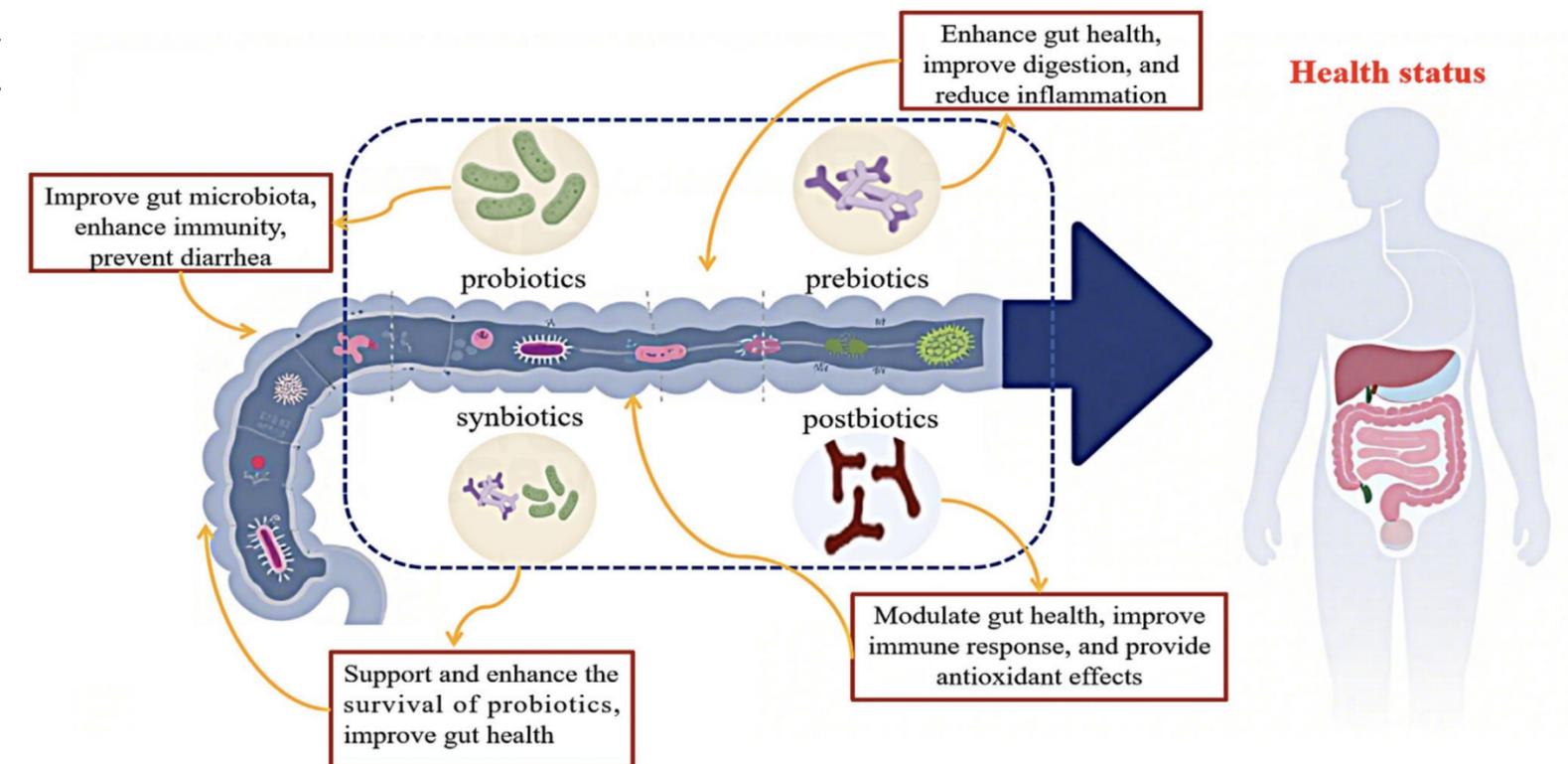
Collias, Supplyside Supplement Journal. Feb 2026.

# Emerging Trends

## Pre, Pro & Postbiotics -> Synbiotics

**Table 2**  
Health effects mediated by probiotics, prebiotics, synbiotics, and postbiotics: an overview.

| Category   | Definition   | Exemplars  | Mechanisms of Action   |
|------------|--|--|--|
| Probiotic  | Live microorganisms, when applied in sufficient quantities, can bring health benefits to the host  | <i>Lactobacillus plantarum</i> , <i>Lactobacillus reuteri</i> , and <i>Lactobacillus acidophilus</i>   | Enhance gut barrier function, produce antimicrobial substances, modulate immune responses                                    |
| Prebiotic  | Substrates selectively utilized by the host microbiota that bring health benefits to the host  | Xylo-oligosaccharides, galacto-oligosaccharides, and fructo-oligosaccharides   | Promote the growth of beneficial bacteria and alter gut microbiota composition   |
| Synbiotic  | Mixtures comprising live microorganisms and substrate(s) selectively utilized by host microorganisms that confers a health benefit on the host | <i>Bifidobacterium lactis</i> HN019, <i>Lactobacillus rhamnosus</i> HN001, and Fructooligosaccharide <i>Lactobacillus suilingensis</i> AF91-01CMCA, and Inulin | Improve gut microbiota diversity, enhance the absorption of nutrients, synergistic effects between probiotics and prebiotics |
| Postbiotic | Probiotic microbial preparations and/or their components that confer health benefits to the host   | Lipopolysaccharides, SCFA, and Trimethylamine Oxide  | Influence gut microbiota composition, reduce intestinal inflammation, enhance antioxidant enzyme activity                    |



**Fig. 7.** Summary of the role of Probiotics, prebiotics, synbiotics, and postbiotics.

# Microbiome “GI-Skin” Brands

| Brand                        | Key Product(s)  | Positioning Statement  |
|------------------------------|---|--|
| Gallinée                     | Calm & Microbiome, Clear & Microbiome, Youth & Microbiome   | World's first microbiome-friendly beauty brand offering targeted probiotic supplements for sensitive, blemish-prone, and aging skin              |
| Advanced Nutrition Programme | Skin Integrate 28 Biome Powder                              | Evidence-based nutrition brand delivering clinically-validated pre/pro/postbiotic blends to optimize the gut-skin axis                           |
| Dr. Barbara Sturm            | Skin Protection Anti-Pollution Food, Anti-Aging supplements | Physician-developed molecular skincare integrating oral supplements with topical formulations for anti-aging and environmental protection        |
| Beauty Pie                   | Supergut Microbiome Capsules                                | Luxury at cost model offering multi-strain probiotics plus micronutrients for microbiome balance and skin clarity                                |
| Wild Nutrition               | Food-Grown Skin, Teen formulas                              | Whole-food nutrition brand using microbiome-relevant B-vitamins and minerals to support hormonal balance and skin health                         |
| Oxiceutics                   | Gut to Glow Microbiome Beauty Complex                       | Doctor-led nutricosmetic brand explicitly engineering gut microbiome optimization for visible skin rejuvenation                                  |
| Skin Moderne                 | i/O Beauti (CoreBiome™ tributyrin)                          | Next-generation postbiotic brand leveraging cellular longevity science (tributyrin, spermidine) for gut-skin-aging axis                          |
| Biotical GS                  | Spore-based probiotics + ceramides + astaxanthin            | Vidya Group's synergistic nutricosmetic combining resilient spore probiotics with barrier lipids and antioxidants for comprehensive skin support |



# Microbiome “GI-Skin” Brands

## GALLINÉE CALM & MICROBIOME SUPPLEMENT

- **Riboflavin** known for helping maintain healthy skin and supporting the protection of the body’s cells from oxidative stress.
- **Folate** long recognised for contributing to normal psychological function and reducing tiredness, folate is a valuable ally for preserving emotional balance.
- **Red algae** *Haematococcus pluvialis* is a red microalga known for its high content of astaxanthin, a carotenoid with antioxidant properties.
- **Live microorganisms to act on the gut-skin-brain axis:** *Lactobacillus helveticus* and *Bifidobacterium longum*, the latter known for improving the skin barrier function



# Emerging Trends

1

High Growth Opportunities

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2

Consumer Drivers

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3

Tech Integration

# Emerging Trends

## Holistic Gut-Skin Positioning

Brands shift from technical "microbiome" jargon to consumer-friendly gut-skin wellness narratives, integrating mental health and lifestyle benefits.

## Postbiotics & Precision Innovation

R&D focus on heat-killed bacteria, fermented extracts, bio-engineered strains paired with AI-driven diagnostics for personalized regimens.

## Regional Growth Dynamics

In July 2025, global Google search for **'skin + microbiome'** were up by nearly **177%** year-on-year.



# Thank You!

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