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# Gut-Skin Axis Protocol

Prepared in collaboration with Integrative Dermatologist Dr. Julie Greenberg, ND

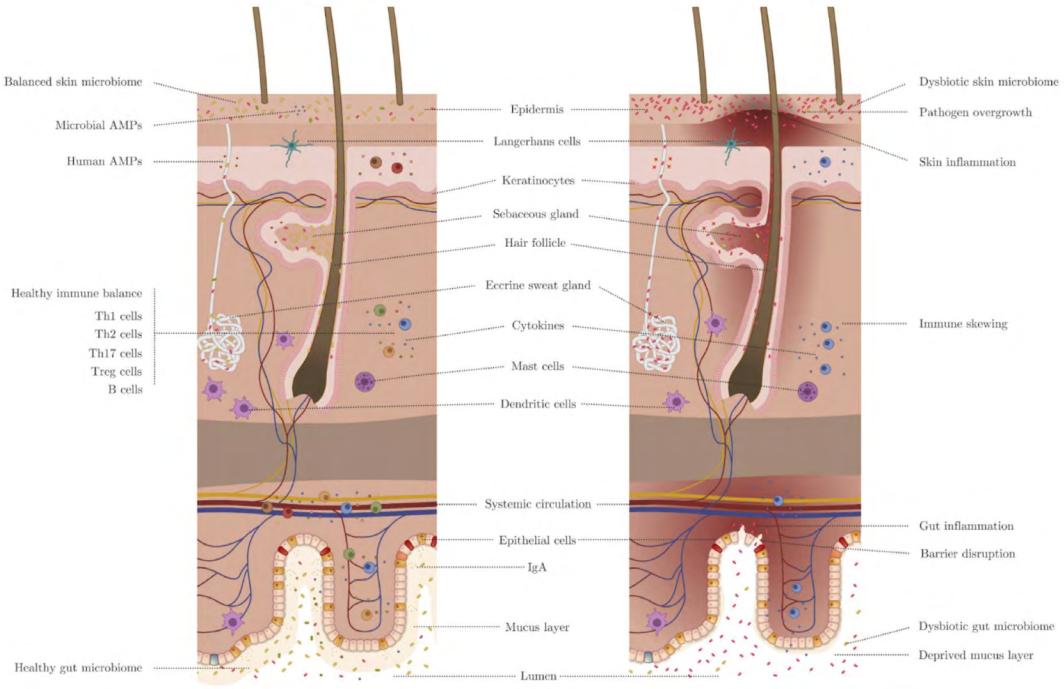
## The Skin Microbiome

Many of us are aware of the microbiome in our gastrointestinal (GI) tract, which is made up of a diverse ecology of microorganisms. Many people have also heard of the connection between gut dysbiosis (imbalance of the GI microbiome) and skin conditions, but people may not realize that the relationship is bidirectional. This interconnected highway is known as the Gut-Skin Axis (GSA). It represents how the microbiome influences skin health and how the immune signaling and health of the skin, in turn, influence the gut microbiome. When the normal relationship between gut microbes and the immune system is compromised, subsequent processes on the skin can be triggered and even develop into skin diseases. The detection of gut microbes may even confirm some skin disease diagnoses.[1]

Our skin harbors its own unique microbiome, with different ecological niches comprised of numerous communities of microorganisms, which can vary dramatically based on location on the body. The skin epidermis, along with its appendage structures, such as sweat and sebaceous glands, provides a total skin surface of about 25 $m^2$ and is one of the largest epithelial surfaces for interaction with microbes.[2] The skin, along with the gut, contains vast numbers of microbiota, with the skin estimated to have about $10^{12}$ microbial cells while the gut accounts for $10^{14}$ microbial cells.[2]

The GSA describes the interaction of the microorganisms and the host immune system and is vital for maintaining skin homeostasis.[3] Disruption of normal microbiota has been seen in numerous inflammatory skin conditions, including atopic dermatitis, rosacea, and psoriasis.[2,3] The association between inflammatory skin diseases and the gut microbiome is driven by a dysfunctional intestinal barrier, increased inflammatory mediators, and undesirable metabolites released by microorganisms.[4]

[1] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9929457/
[2] https://pubmed.ncbi.nlm.nih.gov/35625774/
[3] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7916842/
[4] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9138548/




https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7916842/

## Dandruff and Seborrheic Dermatitis

Dandruff and seborrheic dermatitis (D/SD) are common scalp and skin disorders and typically occur in areas rich in sebum production, such as the head, face, and neck. D/SD is the most common *Malassezia*-associated dermal disorder, occurring in up to 50% of healthy humans and up to 75–90% of immuno-compromised subjects, especially AIDS patients.[5] *Malassezia* is a group of yeasts – single-celled fungal organisms that cause mostly superficial diseases on humans and other mammals.

The diseases that result from a dermatophyte infection are known as tineas, and dermatophytes are different than *Malassezia* yeasts.[5] There is generally far less fungal diversity than bacterial diversity on human skin, with *Malassezia* being the dominant fungal organism found on most areas of human skin. Several studies have found that *Malassezia* can exacerbate both psoriasis and atopic dermatitis (AD), especially when the disorder is localized to the head and neck.

[5] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4109575/

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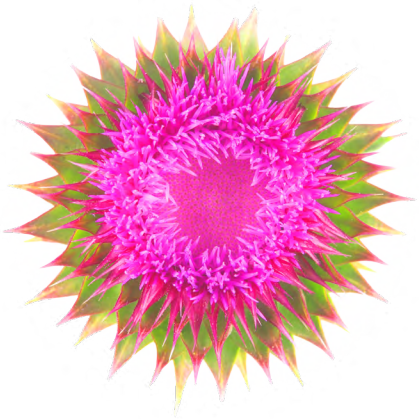
## Skin Conditions and Associated Skin Microbiota

| DISEASE | SKIN MICROBIOTA ASSOCIATION | COMMENTS |
|---|---|---|
| Atopic dermatitis (AD) | Increased abundance of *S. aureus,* decreased bacterial diversity | Herpes simplex virus and Coxsackie virus can infect skin in AD |
| Dandruff and seborrheic dermatitis | *Malassezia* spp. (yeast) | Potential bacterial imbalance |
| Psoriasis | Higher abundance of *Staphylococcus* and *Streptococcus* | Anti-psoriasis treatments may disrupt skin microbiome |
| Rosacea | *Demodex folliculorum* (mites) | *C. acnes* and *Snodgrasella alvi* increased |
| Acne Vulgaris | *Cutibacterium acnes* species | Probiotics may play protective role |
| Hidradenitis suppurativa | *Saccharomyces cerevisiae* (yeast), *Prevotella* and *Porphyromonas* (bacteria) | Anaerobic species in lesions |
| Alopecia areata | Possible imbalance of *C. acnes* and *S. epidermidis* | Possible role of cytomegalovirus and/or *Alternaria* fungi |
| Wound healing | *S. aureus* and biofilm-forming bacteria | *Lactobacilli* and fermented products can be beneficial |
| Skin cancer | Merkel bell polyomavirus, *Fusobacterium, Trueperella, S. aureus* | Increase in certain strains of *S. aureus* and decrease in skin commensals can be associated with squamous cell carcinoma or basal cell carcinoma |

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7916842/

Microbial metabolites partially mediate the effect of the gut microbiome on skin. These compounds interact with skin receptors, directly affecting the skin and/or modifying the skin's commensal bacteria. For example, the gram-positive bacteria *Clostridioides difficile* (formerly known as *Clostridium difficile*) produces metabolites such as p-cresol and phenol, which are also considered biomarkers of gut dysbiosis. These metabolites enter the bloodstream and accumulate on the skin, where they decrease skin moisture, impair the skin barrier integrity, and modify epidermal differentiation and keratinization.[4]



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Conversely, beneficial bacterial species are protective against some dermatological conditions. Psoriasis can be affected by a drop in *Akkermansia muciniphila* and *Faecalibacterium prausnitzii* as these bacteria are responsible for short-chain fatty acid (SCFA) production like butyrate, which protects against systemic inflammatory diseases including Irritable Bowel Disease (IBD), atherosclerosis, and obesity, and is vital in strengthening gut epithelium integrity.[4]

When homeostasis between the microbiome and the immune system is disrupted, the outcome can be over-colonization or infection. Once the system is disrupted, many organisms responsible for chronic skin infections utilize biofilms as a survival mechanism, making them harder to eradicate. Biofilms have been shown to be the main cause of delayed wound healing seen in those with compromised immunity, such as HIV and type 2 diabetes.[6]

The table below illustrates the clinical relevance of the GSA.[3]

| MOLECULES | EFFECT IN THE GUT | EFFECT IN THE SKIN |
|---|---|---|
| BACTERIAL METABOLITES | | |
| SCFAs | Anti-inflammatory | Anti-inflammatory |
| Vitamin D | Suppresses inflammation in IBD | Not reported |
| Urocanic acid | Suppresses inflammation in IBD | Not reported |
| GABA | Neurotransmitter modulation | Itch restriction |
| Dopamine | Neurotransmitter modulation | Inhibition of hair growth |
| Serotonin | Neurotransmitter modulation | Melatonin modulation |
| Acetylcholine | Neurotransmitter modulation | Barrier function |
| Phenol and p-cresol | Biomarker of gut dysbiosis | Impaired epidermal barrier |
| DIETARY COMPONENTS | | |
| Catechins | Anti-inflammatory effects | Anti-inflammatory effects |
| Polyphenols | Anti-inflammatory effects | Anti-inflammatory effects |
| Lycopene | Selectively utilized by host microbiota | Protection against photodamage |
| Prolamin | Not reported | Protection against atopic dermatitis |
| Phytomolecules | Not reported | Anti-aging |
| Gluten | Celiac disease | Dermatitis herpetiformis/rash |

[6] https://pubmed.ncbi.nlm.nih.gov/27935844/

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## Clinical Pearl #1 - Sunshine & Vitamin D

Skin exposure to ultraviolet B (UVB) and indirectly to serum vitamin D levels increase the α and β diversity of the gut microbiome.[3] Ensuring patients have adequate vitamin D levels may support diversity of the gut microbiome, which can positively affect skin health.

## Clinical Pearl #2 - Probiotics & the Skin

Probiotics have been shown to exhibit anti-inflammatory effects both locally and distally from the gut, with several studies indicating that oral probiotic intake may be beneficial for skin health.[6] Some studies with psoriasis show that probiotics help regulate T cells and decrease dryness and inflammation of the skin.[4] Spore-based probiotic supplementation can modulate the skin's biophysical properties and the sebum excretion rate and can be included when addressing skin conditions.[7]

## Clinical Pearl #3 - Include Prebiotic & Phytonutrient-Rich Foods

Dietary prebiotic fibers and resistant starches have been shown to increase the production of short-chain fatty acids, which can benefit intestinal barrier function, reduce inflammation, and affect immune balance – all of which can benefit skin health. Additionally, diets rich in phytonutrients such as polyphenols, catechins, lycopene, and others may further support the skin.

## Lifestyle Recommendations

- Support your treatment with simple yet effective lifestyle recommendations. Check out the list contained in the Bioclear® Microbiome Detox Program Lifestyle Guide.
- Recommend adopting a low-inflammation diet (Modified paleo, Mediterranean, etc.), including a high intake of non-starchy vegetables.
- Advise patients to support the skin by ensuring adequate daily hydration.

[7] https://pubmed.ncbi.nlm.nih.gov/36769543/

# Therapeutic Plan Suggestions

## Gut-Skin Support

| CORE PROTOCOL | | | |
|---|---|---|---|
| ORAL | Biocidin® Liquid or Capsules | Titrate to 15 drops 2x/day | Titrate to 2 capsules 2x/day |
| | G.I. Detox®+ | 2 capsules at bedtime. 1 hour away from food, supplements, and medications. Temporarily increase dose to 2 capsules 2-3x/day if Herxheimer reaction observed/worsens. | |
| | Proflora® 4R | 1 capsule any time | |
| **ADDITIONAL SUPPORT** | | | |
| ORAL | Olivirex® | For complex cases, titrate to 2 capsules 2x/day | |
| | G.I InnerCalm® | 1 stick pack mixed in water, 1-2 times daily, taken any time | |
| TOPICAL | Apply Biocidin® LSF directly to affected skin and allow for absorption before covering. | | |
| | **Spot Treatment:** Apply Biocidin® LSF topically overnight to the affected area. | | |
| | **Mask:** Apply 2 pumps of Biocidin® LSF for 20 minutes before rinsing off 2x/week or as needed. Can be combined with a small amount of clay as a mask or poultice. | | |
| Reminder: Due to the proximity of the oral microbiome to facial skin, it is highly recommended that support for oral dysbiosis/biofilms be considered. | | | |

## Additional Recommendations

RECOMMENDED BY DR. JULIE GREENBERG

1. **SHAMPOO:** Dr. Eddie's Happy Cappy shampoo with zinc pyrithione. Add rosemary essential oil (Mountain Rose Herbs is the recommended source) to shampoo with each use. Apply to scalp and rinse after 2 minutes.
    a. Children - add one drop of rosemary essential oil
    b. Adults - add a 2-3 drops of rosemary essential oil
2. **MOISTURIZER:** Use jojoba oil as a moisturizer instead of other oils. Jojoba contains fatty esters instead of oils and is harder for yeast to use as food.
3. **DIET:** Ideally, adults should consume 35 grams of fiber daily to feed beneficial microorganisms.

TESTS

1. ORGANIC ACID TESTING
    a. Pathogens
    b. Detoxification pathways
2. STOOL MICROBIOME TESTING
    a. Digestive markers (Steatocrit, elastase)
    b. SCFAs
    c. Inflammation (calprotectin, lactoferrin, secretory IgA)
    d. Permeability (zonulin)
    e. Pathogens & commensals (bacteria, fungi/yeast, parasites, viruses)

### Questions?

For clinical questions, email clinical@biocidin.com


*These statements have not been evaluated by the Food and Drug Administration. These products are not intended to diagnose, treat, cure or prevent any disease.