

Probiotics in Acne and Rosacea

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Our understanding of the pathophysiology of acne and rosacea continues to evolve, leading to new therapeutic targets and the development of advanced treatment regimens. In light of increasing antibiotic resistance and a recent interest in natural ways to treat skin conditions, probiotics have emerged as potential adjuvant therapies for acne and rosacea. Probiotics are live microorganisms that may benefit the health of the host and also are capable of secreting substances that appear to confer health benefits. A small number of intriguing preliminary studies support the use of both topical and oral probiotics in the treatment of acne and rosacea.

Topical probiotics or probiotic-derived products might benefit acne- or rosacea-prone skin in a number of ways. First, if a live culture is capable of surviving on the skin's surface, that strain could provide a protective shield on the patient's skin; through competitive inhibition of binding sites, this bacterial interference could prevent colonization by other possibly harmful organisms.¹ This mechanism of action could only be harnessed if a bacterial strain is capable of surviving on epithelial cells. Most of the topical probiotics developed to date are gastrointestinal strains that might not be able to survive on the skin's surface. Second, some bacterial strains have been shown to secrete substances that have antimicrobial properties.² As antibiotics have long been utilized for their antimicrobial and possible anti-inflammatory properties in the treatment of acne and rosacea, one can envision an antimicrobial alternative that works via a unique mechanism to be highly desirable for treatment of both disease states. If these bacterial substances are not as likely as antibiotics to induce microbial resistance with extended use, they would be even more desirable in the treatment of chronic skin disease states. Third, when certain probiotic strains are placed in contact with epithelial cells, they are capable of inhibiting inflammatory pathways and thus the production of inflammatory cytokines.³ Because chronic inflammation plays a major role in

acne and rosacea, a natural immunomodulator could play a needed role in their treatment. Some of these mechanisms require live cultures to survive on the skin, while others would require the development of a probiotic lysate or derivative that maintains its functionality when applied to the skin.

Oral probiotics also could influence conditions such as acne and rosacea by affecting the so-called gut-brain-skin axis.⁴ Probiotics and their metabolites interact with the gut-associated lymphoid tissue, which comprises close to 70% of the body's immune system. This interaction is critical in training the immune system to make good decisions about how it will respond to pathogens, allergens, or commensal bacteria. Oral probiotics have been shown to regulate the release of inflammatory cytokines within the skin⁵ and improve insulin sensitivity⁶ in animal models, which is relevant in light of recent analysis linking high glycemic diets with acne.⁷

Interestingly, constipation is more frequent in acne patients.⁸ Constipation also is associated with alterations in the intestinal microflora,⁹ including lower fecal concentrations of healthy bacteria such as *Lactobacillus* and *Bifidobacterium* and higher intestinal permeability.¹⁰ Psychological stress encourages bacterial overgrowth, stagnates normal transit time in the small intestine, and compromises the intestinal barrier.¹¹ As we are well aware, stress also is linked to acne. An Italian study in 2008 demonstrated that rosacea patients have a significantly higher level of small intestinal bacterial overgrowth compared to controls ($P < .001$). Eradication of small intestinal bacterial overgrowth state and normalization of the intestinal flora via the antibiotic rifaximin led to improvement of rosacea, which was maintained for more than 9 months.¹²

The health of the gut, brain, and skin appear to be linked. Psychological distress (eg, anxiety, depression) either alone or in combination with the consumption of processed comfort foods devoid of fiber slows gut motility and alters the gastrointestinal flora, which in turn leads to increased intestinal permeability. Not only are markers of systemic inflammation subsequently increased, but substance P also is elevated and insulin sensitivity is decreased. In patients who are already genetically susceptible to acne or rosacea, this cascade is thought to influence the skin and potentially exacerbate these conditions.⁴ Methods by which one

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might influence this cascade and prevent it from occurring include altering the gastrointestinal flora via supplementation with oral probiotics, supplementing with foods or beverages that contain beneficial microbes (eg, yogurt), and establishing dietary patterns that emphasize high fiber foods including plentiful vegetables.^{13,14}

A Korean study established that consumption of a *Lactobacillus*-fermented dairy beverage improved the clinical grade of acne over 12 weeks. Although the addition of lactoferrin, an anti-inflammatory milk protein, to the probiotic beverage increased the efficacy of inflammatory lesion reduction, the benefits observed by the placebo group who received fermented milk only suggests that probiotics might play an adjuvant role in acne therapy.¹⁵ Another study recently conducted at the University of California, Los Angeles, found that the presence of acne was correlated with the particular strain of *Propionibacterium acnes* colonizing the pilosebaceous units as opposed to the quantity of bacteria present.¹⁶ In fact, participants without acne were more likely to be colonized with one particular strain of *P acnes*, which might protect the host from developing acne. In the past, researchers felt comfortable classifying bacteria based on their genus and species, but this study added yet another level of complexity to the probiotic story, highlighting the importance of the strain, even when the genus and species are identical.¹⁶

Although the use of probiotics and probiotic-derived products is still controversial, I believe the potential exists for them to eventually play a role in the treatment of inflammatory skin conditions such as acne and rosacea. More studies are needed to identify the most beneficial species or derivatives thereof and determine if topical or oral administration is the superior route. The strain of the bacteria also needs to be considered because we suspect that even different strains under the same genus and species can behave differently.

Even though probiotics are unlikely to replace our current therapeutic options in the near future, I am already incorporating probiotics in my practice as an adjunct to oral antibiotic therapy. I know that oral probiotic use also can decrease the risk for vaginal candidiasis and help minimize gastrointestinal side effects of antibiotics. Whether these probiotics also are assisting in the resolution of acne or rosacea has yet to be determined.

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