

The relationship between the gut microbiome and skin disorders: in search of new probiotics for dermatology

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ABSTRACT

Gut microbiome variations have been described in several skin disorders, including atopic dermatitis in children and psoriasis in adults. In both pathologies, an increase in blood markers for oxidative stress and inflammation has also been detected. Taking these results into account, we have developed specific blends of probiotics for each of these skin conditions which have also been studied in clinical trials. The results have shown that nutritional supplementation with these functional ingredients can improve the treatment of such skin disorders.

Keywords

Psoriasis
Atopic dermatitis
Gut microbiome
Probiotic

Introduction

Skin diseases are common human illnesses. They occur at all ages in all cultures and, depending on the condition, affect between 30% and 70% of individuals [1]. The overall incidence of bacterial, fungal, and especially atopic and immunological skin diseases such as atopic dermatitis (AD) or psoriasis, has increased over the last few years [2].

These conditions impose a large burden with psychological, social and financial consequences for patients, their families

and society [3]. They are an important cause of poor health globally, so it is important to study them in an effort to improve patients' lives.

Bacterial DNA translocation in the blood samples of patients with psoriasis has recently been described by some of the authors of this article, suggesting the presence of circulating bacterial DNA in blood originating from the intestinal lumen [4]. Many other authors have also proposed a relationship between a disruption in intestinal barrier function and AD [5]. Recently, analysis of the gut microbiota of patients with AD has shown an intra-species compositional change in *Faecalibacterium prausnitzii* which reduces the number of high butyrate and propionate bacterial species producers [6]. These changes in the gut environment suggest that probiotics may have a role as potential nutritional supplements for the treatment of AD and psoriasis.

In the case of psoriasis, scientific articles on the use of probiotics are lacking. In contrast, several reports in the literature discuss the efficacy of probiotics for the prevention and treatment of AD [7, 8] and conclude that probiotics could be an option to improve moderate and severe AD in children and adults. However, definitive evidence supporting probiotic effectiveness and clinical trials demonstrating strain-specific effects are lacking. Therefore, 3 years ago our multidisciplinary group began to investigate probiotics for AD and psoriasis.

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Methods and results

In the case of AD, we first studied the gut environment of children with moderate AD. We identified important changes in the gut microbiome, especially in patients with active skin lesions (unpublished results). Interestingly, also we detected an increase in several oxidative stress and inflammatory markers in all patients. Based on these results, we formulated a mixture of three probiotics with anti-inflammatory and antioxidant properties (*Bifidobacterium lactis* CECT8145, *Bifidobacterium longum* CECT7347 and *Lactobacillus casei* CECT9104). This probiotic mixture was administered to patients with moderate AD in a double-blind, two-arm placebo-controlled trial with stratified randomization by baseline variables [9]. The patients were children aged 4–17 years who were also treated during the 12-week study with topical corticosteroids according to the guidelines for the management of AD. Our results suggest that administration of this probiotic mixture as adjuvant treatment is effective in reducing the globally recognized SCORAD index for AD [9]. The response was better than that obtained with other probiotics tested in a previous placebo-controlled clinical trial and was reflected in all components of the index (eczema extension, eczema intensity and subjective symptoms). More interestingly, there was a significant reduction in the use of topical steroids to treat flares in the probiotic arm compared with the placebo arm. Moreover, as Fig. 1 shows, after the 3 months of treatment with the probiotic mixture, more than 90% of the children in the probiotic group could be classified as ‘almost clear’ or ‘clear’ of AD, compared with only 20% in the control group. To our knowledge, this is the first probiotic clinical trial for AD published in a dermatological journal. Highlighting the relevance of these re-

sults, comments on this article have been published in *Med-Page Today* (<https://www.medpagetoday.com/dermatology/generaldermatology/71070>) and in *NutraIngredients* (<https://www.nutraingredients.com/Article/2017/11/13/Probiotics-ease-symptoms-of-childhood-dermatitis-and-reduce-need-for-steroids-Study>).

Similarly to our AD program, we also conducted a study analysing the gut microbiome of patients with psoriasis. In a cohort of 52 patients with psoriasis, we detected a specific ‘psoriatic core intestinal microbiome’ that clearly differs from that in a healthy population [10]. In addition, those psoriatic patients classified with gut enterotype 2 tended to experience more frequent bacterial translocation from the intestinal lumen and had a higher inflammatory status than patients with other enterotypes. As in the case of AD, based on these results and other data on the gut environment in patients with psoriasis, we prepared a different probiotic mixture also consisting of *Bifidobacterium* and *Lactobacillus* probiotic strains. The results of the trial are very promising and will be published in the near future.

Conclusion

In conclusion, the use of massive genome sequencing to better understand the gut microbiome of patients with AD or psoriasis in combination with examination of key gut environmental factors (inflammation, oxidative stress) allowed us to develop probiotic mixtures that were extremely effective in clinical trials. We are exploring possibilities in other skin disorders. This ‘bottom-up’ strategy and elucidation of the biological basis of AD and psoriasis will enable the development of probiotic solutions—the next generation of probiotics.

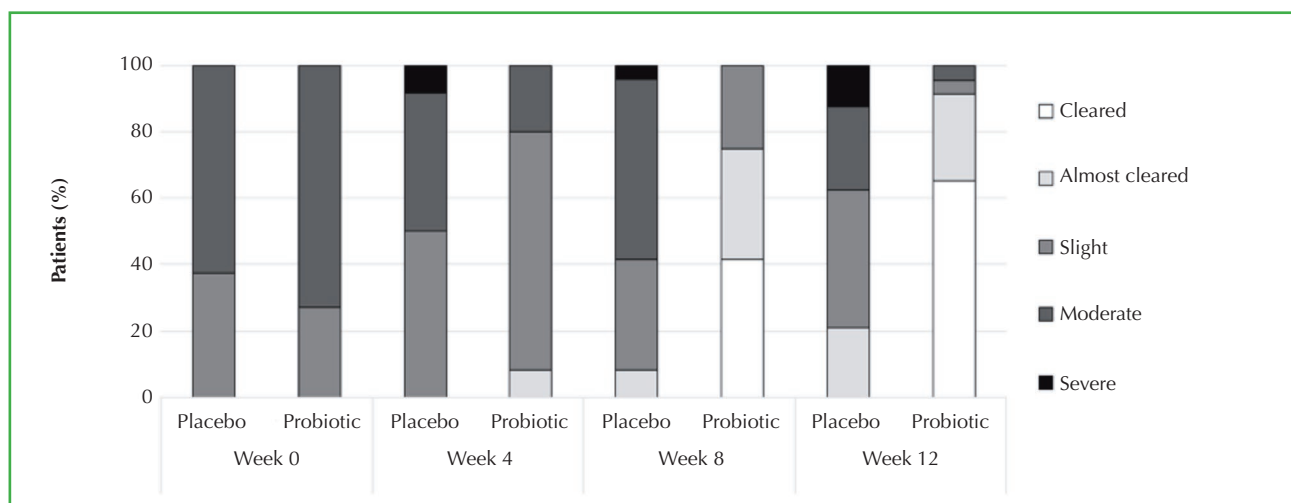


Figure 1 - Evolution of atopic dermatitis classification during the 3 months of treatment with the probiotic mixture

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