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Efficacy of a Plant-Based Anti-Inflammatory Diet as Monotherapy in Psoriasis

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Abstract

Psoriasis is an immune-mediated disease associated with many comorbidities, including obesity, metabolic syndrome, and cardiovascular disease. Many patients seek alternatives to standard treatments. In this case report, we present a non-obese patient who was able to completely clear her psoriatic plaques by following a plant-based, anti-inflammatory diet, focusing on the consumption of nutrient-dense foods. The efficacy of this anti-inflammatory diet may lie in the overall reduction of the systemic inflammatory state associated with psoriasis. Possible mechanisms of action are explored.

KEYWORDS Psoriasis comorbidities; Nutritarian diet; Anti-inflammatory diet; Nutrition; Micronutrients; Osteopontin; Beta-carotene

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Introduction

Psoriasis is a chronic inflammatory disease that may be associated with comorbidities including obesity, metabolic syndrome, and cardiovascular disease. Many effective treatments are available for psoriasis, such as topical therapies, systemic agents, and phototherapy. However, many patients inquire about alternative treatments, especially when they are unsatisfied with the results of their current medications or are concerned about their associated side effects or costs. There is increasing evidence to suggest that lifestyle modifications such as weight loss and dietary changes can significantly improve the number and severity of symptoms. We present the case of a patient with a long-standing history of psoriasis who was able to achieve and maintain clear skin by following a plant-based, nutrient-dense, anti-inflammatory diet. Written, informed consent for patient information and images to be published was provided by the patient.

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Presentation

A non-obese woman in her late 50s presented with a 35-year history of psoriasis. Due to delayed diagnosis, her symptoms had been unsuccessfully managed with anti-histamines and intermittent oral corticosteroids for 19 years. Her medical history was also significant for Sjogren's syndrome and Hashimoto's thyroiditis. Seeking to improve her health through diet modification, rather than through conventional medical therapies, she followed a whole-food, plant-based, anti-inflammatory diet recommended by her primary care physician (Figure 1).

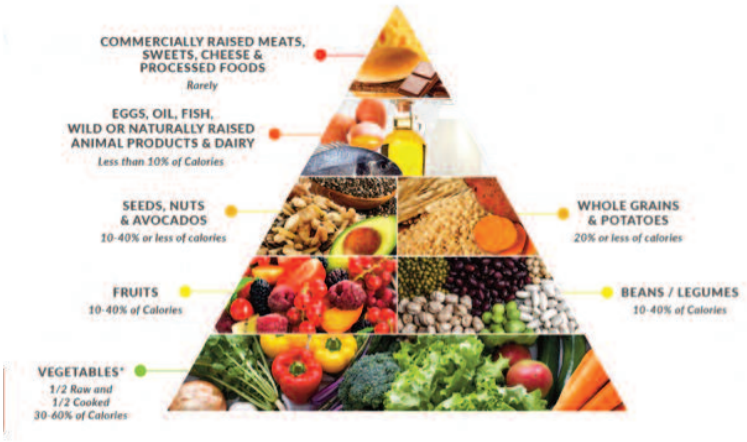
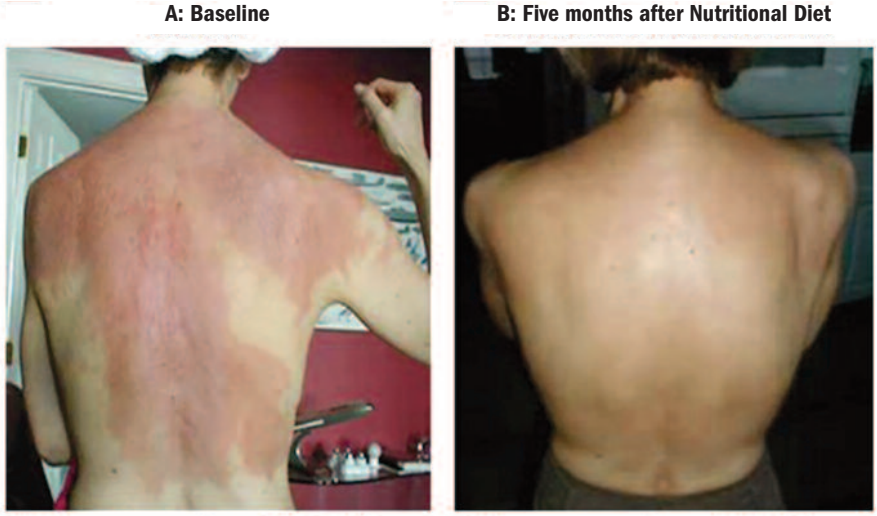


Figure 1: Nutritarian food pyramid.
Plant-based gluten-free anti-inflammatory diet developed by Joel Fuhrman, MD. Reproduced with permission from Joel Fuhrman, MD.

The patient first noticed improvements within 3 months. Dramatic changes were seen after 5 months (Figure 2).



BMI	29.6 kg/m^2	BMI	19.8 kg/m^2
Weight	140 lb	Weight	108 lb
Blood Pressure	98/62 mm Hg	Blood Pressure	110/78 mm Hg
Total Cholesterol	216 mg/dL	Total Cholesterol	163 mg/dL
ESR	36 mm/hr	ESR	6 mm/hr

Figure 2: Efficacy of the Nutritarian diet for psoriasis and associated comorbidities.
Patient before (A) and after (B) adhering to a Nutritarian whole-food, plant-based anti-inflammatory diet for approximately 5 months.

The percentage of the patient's body surface area (BSA) affected by psoriasis was estimated using the rule of nines, a tool used to estimate total BSA in which percentage values are assigned to each major body part—9% for the head and neck, 9% for each arm, 9% for the anterior and posterior legs, and 9% for each of 4 trunk quadrants [1]. After 1 year, her percentage of BSA affected decreased from 40% to completely clear (0%). In addition, her symptoms of dry eyes, dry mouth, and joint pain resolved without the need for medications specifically addressing Sjogren's syndrome. Significant decreases in weight (140 lb to 108 lb), body mass index (BMI) (29.6 kg/m^2 to 19.8 kg/m^2), and total cholesterol (216 mg/dL to 163 mg/dL) were also observed. Prior to diet modification, her erythrocyte sedimentation rate (ESR), an inflammatory marker, was elevated at 36 mm/hr. After diet implementation and subsequent clearance of psoriasis, her ESR reduced to 6 mm/hr. The patient has been following this anti-inflammatory diet for 17 years and only reports psoriasis flares when she is not compliant with the diet, citing sugar, white flour products, and alcohol as triggers. The only medication she currently requires is levothyroxine sodium (112 µg/day) for hypothyroidism.

Discussion

The pathophysiology of psoriasis involves *T*-cell hyperactivity and overproduction of pro-inflammatory cytokines, including IFN-g, TNF-a, IL-6, IL-17, IL-22, and IL-23 [2,3,4]. Psoriasis has been linked to many comorbidities such as obesity and cardiovascular disease, through a common inflammatory pathway [2,3,5]. Several studies report a direct correlation between psoriasis area severity index (PASI) scores, a measure of psoriasis severity, and increased C-reactive protein (CRP) levels [6].

Multiple studies have demonstrated that patients with psoriasis are frequently overweight or obese compared with patients without psoriasis [3,4,7]. Increased BMI has been correlated with incomplete treatment response to biologics and weight loss has been shown to increase the effectiveness of some of these medications [7,8]. Adipose tissue is a metabolically active tissue that directly contributes to chronic inflammation through the release of pro-inflammatory cytokines [5]. Low calorie diets may improve psoriasis through the reduction of obesity-derived pro-inflammatory adipokines and cytokines [3,4,5]. A meta-analysis on the effects of weight loss through diet and exercise showed that weight loss alone reduced the PASI score by 2.3 when compared with the non-intervention group [9]. Furthermore, studies have shown that the beneficial effect weight loss has on psoriasis may be long-term [10]. Our patient is considered overweight on the BMI spectrum and experienced weight loss, which could have led to spontaneous remission of her psoriasis.

However, the fact that our patient is non-obese and experiences flares in symptoms by consuming certain food groups despite maintaining a normal healthy weight points to other potential factors that may explain the role of dietary intervention independent of weight loss. Evidence has shown that high osteopontin (OPN) levels, a glycoprotein involved in both TNF-alpha secretion and Th17 regulation, is significantly associated with psoriasis, independent of obesity, and, therefore, may be a potential target in patients with psoriasis who have a normal BMI [11]. Furthermore, OPN has been used as a clinical marker for atherosclerosis and may play a role in increased cardiovascular risk in patients with psoriasis, independent of obesity-related cardiovascular effects [11]. While data thus far is limited to in vitro and animal studies, evidence suggests that OPN levels can be modified by diet. Consumption of omega 3 fatty acids (FAs), and antioxidants such as green tea and vitamin E, as well as a low-fat diet, have been shown to reduce OPN levels in splenic, renal, and adipose tissue, respectively [12,13,14]. The relationship between diet and osteopontin, however, is complex, and further studies are needed to elucidate the effect of diet on osteopontin levels in patients with psoriasis.

The diet used in this case—the Nutritarian diet developed by Joel Fuhrman, MD—which is a plant-rich (animal products restricted to 5% of calories or less), micronutrient-dense diet that has been shown to improve diabetic and cardiovascular parameters [15,16,17]. This diet focuses on maximizing the intake of micronutrients through consumption of foods with the highest ratio of nutrients to calories. The menus are relatively low glycemic and protein-adequate in spite of the restriction on animal products. The majority of this diet is made up of nutrient-rich plant foods that contain health-promoting phytochemicals: green vegetables, non-starchy and starchy vegetables, fruits, beans/legumes, nuts, seeds, avocados, and some whole grains such as quinoa. Though no calorie counting is advised, a diet rich in nutrients and fiber may cause appetite suppression, which typically leads to weight loss [18]. In addition to the benefits of weight loss, the driver of psoriasis improvement may be the amount and wide spectrum of micronutrients, particularly antioxidants and phytochemicals consumed in this diet, with their anti-inflammatory effects, along with the lowering of growth hormones such as insulin, insulin resistance, and IGF-1 [19,20,21].

A gluten-free diet has been associated with a significant decrease in PASI score in patients with anti-gliadin antibodies [22]. One study demonstrated that the number of Ki67+ cells, corresponding to proliferating endothelial cells, decreased in both involved and uninvolved psoriatic dermis after patients followed a gluten-free diet [23]. Although there is a gap in the literature regarding the effect of a gluten-free diet in individuals without anti-gliadin antibodies, a national survey reported that 53% of patients with psoriasis noticed improvement in their skin after eliminating gluten from their diets [24].

Vegetarian diets have been shown to improve psoriasis, by modifying polyunsaturated fatty acid metabolism, altering the eicosanoid profile, and suppressing inflammation [4,5]. In this case, not only were animal products severely restricted, but so were sugar, white flour, high-glycemic processed foods, and high acrylamide containing baked and fried foods, which are also linked to autoimmune phenomenon [25].

The consumption of vegetables and fruits may be beneficial in psoriasis management due to their high content of antioxidants, such as flavonoids, vitamin C, and carotenoids [4]. Beta-carotene is esterified to retinyl esters in intestinal mucosa and acts on keratinocyte retinoid-responsive genes to decrease inflammation and restore normal epidermal differentiation [26,27]. Beta-carotene levels have been inversely related to psoriasis severity [4].

Avoiding animal protein further helps to reduce inflammatory processes, since high dietary content of advanced glycated end products (AGEs) increases the production of inflammatory cytokines [4,28]. Refined carbohydrates also contribute to AGEs and acrylamides. Animal protein also contains high levels of arachidonic acid and omega 6 polyunsaturated fatty acids responsible for the production of eicosanoids, which promote inflammation [28]. Animal protein is also the primary driver of IGF-1, thus animal protein restricted diets and vegan diets lower the IGF-1 response considerably [29]. Expression of IGF-1 via dermal fibroblasts may promote keratinocyte proliferation in psoriasis [19,30,31]. Consumption of animal protein, compared with plant-based sources of protein, is associated with higher levels of inflammation [5,28]. Animal products also lead to the growth of bacteria in the gut that promote inflammation. Trimethylamine oxide (TMAO) is the most heavily studied of these pro-inflammatory compounds resulting from unfavorable dietary-induced bacterial growth [32].

Conclusion

The combination of consumption of nutrient-dense, anti-inflammatory, and plant-based foods appears to lead to weight loss but also a reduction in the overall inflammatory state associated with psoriasis. By adhering to a nutrient-dense, predominantly

plant-based diet, patients with psoriasis may be able to reduce psoriasis severity and simultaneously improve their overall health through normalizations in weight, cholesterol, and blood pressure. Additional research studies, with larger sample sizes, including varying genders, ages, and ethnicities, are warranted to confirm the efficacy of this type of diet in patients with psoriasis who seek an alternative to conventional therapies. The rapidly increasing incidence of psoriasis, which almost doubled between the 1970s and 2000 [33], coupled with the increased prevalence of obesity during the same time period [34], speaks to the need for further research into dietary interventions, which may have an impact on reversing and improving this trend.

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Authors

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Joel Fuhrman, MD: conception and design of the study, revision of the manuscript, approval of the final version of the manuscript
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Declaration of conflicting interest

The authors declare that there is no conflict of interest.

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