

## **Nutrition and Lifestyle in Acne Treatment and Prevention**

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Acne vulgaris is the most common skin disease, affecting 80% of the population between ages 12 and 25. Acne is caused by excess oil in the skin (also known as sebum). This oil comes from sebum secretion by the sebaceous glands at the root of the hair follicles. This oily build up occludes the pores in the skin causing blockage and infection. The well-known practice of "popping" a pimple forces the occluding plug to pop out of the pore, thereby allowing drainage of the sebaceous glands at the root of the hair follicle and providing temporary relief. However, popping pimples can lead to permanent scarring, which also occurs when individuals pick at acne lesions.

Acne tends to occur when the sebaceous glands in a person's skin make too much oil (sebum). The oil combines with cells that line the walls of these glands and clogs the person's skin pores. Clogged pores lead to pimples, whiteheads or blackheads on the face, neck, shoulders, back or chest. Sebaceous glands are the largest at birth and then reduce in size until adolescence. They once again enlarge during pre-puberty with changes in hormone levels influencing sebaceous gland secretion. This increase in production of sebum is the reason that acne is so prevalent in adolescents and teenagers. With excess sebum production, bumps called comedones appear on the skin due to blockage of follicles by sebum. Inside these comedones, there are bacteria and yeast that work on the sebum causing it to release free fatty acids, which cause inflammation and sometimes rupture of the comedones. The causes of acne are very complex and involve many different systems and chemicals within the body. Hormones, enzymes, and the immune system all interact together resulting in different reactions in each individual.

In recent years researchers have identified how various dietary factors influence acne incidence and severity. Several studies have shown that acne can be improved to varying degrees through targeted dietary measures, sometimes in conjunction with the use of specific, targeted supplements. The degree to which dietary factors can influence acne might surprise you, based on recent insights into the mechanisms through which dietary factors affect signaling agents within sebaceous glands. Dietary factors that overstimulate these signaling mechanisms can increase the rate of cell division and/or prompt sebaceous gland cells to over-secrete acne-promoting sebum. As such the information presented

in the related sections of this feedback report will likely help you understand evidence-based, proactive steps you can take towards improved skin complexion via specific dietary and other lifestyle interventions.

## **Dietary Factors and Acne**

There is much controversy over the impact that dietary factors have on the development and severity of acne. Although further scientific substantiation is required, some evidence exists to show that the following dietary modifications may be helpful in some cases:

Although acne appears to have a genetic component and is associated with hormonal changes during puberty, recent studies provide compelling evidence that the frequency and severity of acne can be modified by dietary factors. Some dietary factors have been shown to increase acne breakouts while other dietary factors have been shown to suppress acne breakouts. A summary of these research findings is presented below:

**Refined Sugars** - In general, foods that raise blood sugar levels (refined sugars from many various sources) also raise blood insulin levels. High insulin levels, in turn, have been shown to stimulate sebaceous gland proliferation and sebum production. High insulin levels also increase the circulation of testosterone and other androgens (male hormones), which further stimulate sebaceous glands in the skin to over-secrete sebum. Sebum is the fatty-waxy secretions that can clog the pores, ultimately producing acne lesions. High blood insulin levels also increase circulating IGF-1 (insulin-like growth factor -1) release from the liver, which influences acne-forming factors such as androgens, growth hormone and glucocorticoids (i.e. cortisol).

Several studies have been undertaken with acne patients to examine the effect of refined sugars on acne incidence and severity. An association between high-glycemic-index foods (sugary foods and beverages) and longer acne duration was reported, whereas two randomized controlled trials associated low-glycemic-index diet with reduced acne risk. Example of low-glycemic foods includes things like beans and beans (instead of other starchy foods) and non-sweet vegetables (broccoli, cauliflower, kale etc.), low-carbohydrate/high fiber cereal, and non-sugar containing beverages. The investigators reported that foods with a high-glycemic index may contribute to acne by elevating serum insulin concentrations

(which may stimulate sebaceous gland cell proliferation and sebum production), suppress sex-hormone binding globulin (SHBG) concentrations, and raise androgen concentrations. On the contrary, low-glycemic-index foods increased SHBG and reduced androgen levels; this is important since higher SHBG levels were associated with lower acne severity.

It has been reported that people living in the Kitavan Islands (off the coast of Papua New Guinea) and the Aché hunter-gathers of Paraguay do not suffer from acne and this is associated with their low-glycemic diet, consisting mainly of fresh fruits, vegetables, and lean proteins. Studies on the effects of diet on acne vulgaris have shown that occurrence of acne is lower in rural and non-industrialized areas than in Western populations. It is believed that it may be a result of differences between glycemic loads of diets of both populations.

In 2002, Cordain *et al.* conducted a study among two non-Western populations – the Kitavan Islanders of Papua New Guinea and the Aché hunter-gatherers of Paraguay. Among approximately 1300 subjects, no cases of acne were reported. Researchers suggested that a low-fat intake and low glycemic load diet may be the cause of acne absence in both populations. There is no acne in adolescent Kitava during puberty who live on a Paleolithic diet and do not consume hyper-insulinemic (sugary), IGF-1-raising foods like high-glycemic carbohydrates and dairy proteins. Both sugary foods and the high consumption of the amino acid leucine found in milk and milk products have been shown to overstimulate another key pathway that leads to acne formation. This pathway is known as the mTORC1 pathway. When stimulated the mTORC1 pathway causes sebaceous cells to divide faster and secrete more sebum, which ultimately contributes to acne formation. As researchers conclude, there appears to be a threshold for mTORC1-mediated acne which is clearly exceeded under conditions of Western lifestyle and nutrition (linked to high-glycemic carbohydrates and dairy products).

**Dairy Products** – acne studies also seem to implicate high intake of dairy products with incidence acne and acne severity. This is largely due to the types of fat dairy products (2% milk, 2% yogurt, whole milk, butter, cheese, ice cream, whipped cream, cream, etc.), as well as the high leucine content of milk products (leucine is an amino acid). Like sugary foods, dairy products have been shown to increase IGF-1 levels, which stimulate over-secretion of sebum from sebaceous glands, contributing to acne. Leucine over stimulates the mTORC1 pathway and dairy fats and hormones found in dairy products are thought to over-stimulate sebaceous

gland activity as well. As one researcher noted, in the North American diet mTORC1-activating system from dairy ingestion is frequently combined with hyperglycemic, sugary carbohydrates or pure sugar (milk plus sugary cornflakes, milk chocolate or ice cream etc.), a combination which really ramps-up mTORC1 activation.

**Chocolate** – although not a consistent finding, the ingestion of chocolate has been reported to aggravate certain cases of acne. As chocolate contains milk and sugar (milk chocolate) it is not surprising to see this association in a large number of individual case reports. The cocoa itself may not be implicated.

**Good Fats vs Bad Fats** – some published studies show that certain fats can help suppress the incidence and severity of acne. Good fats tend to decrease the rate of cell division and suppress inflammation, including inflammation within the skin. A study conducted in 1961 in North Carolina among over 1000 teenagers showed that people who consume large amounts of fish and seafood have fewer symptoms of acne (blackheads, papules, pustules, oily skin). A small study of 5 patients, published in 2008, showed that among patients who consumed dietary supplements based on omega-3 fatty acids (it consisted of EPA, selenium, zinc, and chromium) a reduced number of acne lesions was observed.

Numerous studies have revealed that clinical imbalances of specific essential fatty acids are associated with a variety of skin problems. Hence dry, itchy, scaly skin is a hallmark sign of fatty acid deficiency. More relevant to this review is a publication which suggested that the sebum of acne patients is relatively deficient in the omega-3 fat, alpha-linolenic acid, found in high amounts in flaxseed oil, wheat germ and wheat germ oil, and some other plant-based sources. A nutritional study in two groups of women who were given flaxseed or borage oil for 12 weeks demonstrated some skin benefits. Skin irritation, changes in skin reddening and blood flow were diminished in both groups, compared to the placebo group, providing evidence that skin properties can be modulated by intervention essential fatty acid supplementation.

In general, our Western diet is not only deprived of omega-3-fats but is also a diet rich in refined carbohydrates, which is linked to increases acne incidence and severity. Acne researchers summarize by stating that the Western diet stimulates all three major pathways important for mTORC1 activation. The Western diet

provides abundant energy, glucose (sugar), and fat that increases mTORC1 signaling. The high glycemic load increases glucose availability and stimulates increased glucose-dependent insulin signaling. High intake of insulin-raising foods has been a matter of concern for more many years now. Despite all efforts in prevention the total yearly consumption of sugar still increases worldwide. Highly glycemic and insulin-raising foods are ubiquitous elements of the Western diet and comprised 47.7% of the per capita energy intake in the United States in the year 2002. Today, the proportion of raising foods will be much higher and is further driven by expanding activities of multiple fast food distributors.

Here is a direct quote from Dr. B Melnik - the Department of Dermatology, Environmental Medicine and Health Theory (University of Osnabrück; Osnabrück, Germany) in his review paper in the journal *Dermatoendocrinology* in 2012):

“Epidemic acne of Westernized societies should be considered as a visible model disease of exaggerated mTORC1 signaling promoted by the Western diet. Dermatologists should not needlessly waste time with controversial discussions concerning isolated food components in the pathogenesis of acne but should realize the emerging whole network of exaggerated mTORC1 signaling mediated by Western diet. The most important task of preventive dermatology will be the reduction of mTORC1. All three major stimulatory pathways of mTORC1 activation have to be attenuated.

Dietary intervention in acne should thus (1) decrease total energy, glucose and fat intake, (2) diminish insulin/IGF-1 signaling predominantly mediated by high dairy protein consumption, and (3) should limit the total leucine uptake predominantly provided by increased animal protein intake including meat and dairy proteins.

This comprehensive dietary strategy can only be achieved by higher consumption of vegetables and fruit and reduction of animal-derived food. Indeed, diets enriched in vegetables and fruits, vegan diet as wells as Paleolithic diet (excluding sugar, hyperglycemic grains, and dairy) have all been demonstrated to improve insulin sensitivity in type 2 diabetes, and metabolic syndrome and showed preventive effects in the development of Alzheimer disease.

According to the recent Korean acne diet study, the frequency of vegetables and fish intake was significantly higher in the acne-free control group than in the acne group consuming more hyperglycemic carbohydrates, processed meat, and dairy

products. Paleolithic diet regimens come close to the goal of attenuated mTORC1 signaling but one has to consider that unlimited total protein intake may overstimulate leucine-mediated mTORC1 activation. Vegetable-accentuated diets provide less mTORC1 activating signals and additionally contain natural plant-derived mTORC1-inhibitors like resveratrol, EGCG, curcumin, genistein, and indole-3-carbinol monomers, precursors of 3,3'-diindolylmethane.

The dermatologist should take responsibility for dietary education and intervention of his (or her) acne patients and should initiate first measures in correcting a harmful nutritional pathway of over-activated mTORC1 signaling with long-term adverse effects. A deeper understanding of diet-mediated mTORC1 signaling will help to appreciate the statement of Hippocrates of Kós who said about 2,400 y ago, "Your diet should be your medicine, and your medicine should be your diet." <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3408989/>

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## Supplements and Acne

Various vitamins and minerals are important for the health of the skin and supplementation and some of these nutrients have been shown to be helpful in the complementary management of some acne cases.

**Vitamin A** plays an essential role in skin's health. Vitamin A deficiency causes abnormal visual adaptation to darkness but also dramatically affects the skin,

producing dry skin, dry hair and broken fingernails among the first manifestations of vitamin A deficiency. This nutrient, which is stored in the liver, is found also in the skin, particularly in the sebaceous glands, which have vitamin A receptors. In fact, vitamins A and D are the first group of nutrients that have been reported to exhibit properties as skin hormones. In that property, they control metabolism, activation, inactivation, and elimination of specialized skin cells. Many retinoids (forms of vitamin A) are also hormones since they bind to and activate specific receptors on the skin cell's and sebaceous gland cell's DNA, affecting their cellular function on a direct genetic level. Vitamin A and its natural metabolites have been approved for the topical and systemic treatment of mild, moderate and severe, acne, as well as in the treatment of photoaging, biologic skin aging, and several other health conditions. Approximately 50% of adults ingest only about 50% of the recommended amount of vitamin A each day from food. As such, taking a multiple vitamin and mineral supplement that contains 2500 IU of vitamin A is helpful in some cases to ensure more optimal vitamin A nutritional status, which sometimes improves skin complexion. Excess vitamin A can be dangerous, damaging the liver and other organs, and thus high doses of vitamin A supplementation should be avoided. Vitamin A supplements can also increase the risk of birth defects if taken by pregnant women, and thus, women of child-bearing age should not ingest more than 5,000 IU per day of vitamin A from a combination of food and supplements. In general, it may be wise to consider taking a multiple vitamin and mineral supplement to guard against any nutrient deficiencies that can adversely affect acne. Just make sure that the total amount of preformed vitamin A in the supplement does not exceed 2500-3000 IU unless prescribed by your physician.

**Vitamin D** is also an important nutrient in the skin. In fact, vitamin D is made in the skin from the conversion of 7-dehydrocholesterol into cholecalciferol (vitamin D) upon exposure to sunlight or UV-light. In skin cells, this form of vitamin D ( $1,25(\text{OH})_2\text{D}_3$ ) regulates growth and maturation of skin cells. Vitamin D helps slow down the cell division rate of skin cells, and thus, may be helpful in acne. For the same reason, vitamin D-like drugs have been developed for the treatment of psoriasis, which is characterized by an aggressive hyperproliferative (rapidly dividing cells) skin disease.

**Vitamin E**, like vitamin A and vitamin D, is another important fat-soluble vitamin, which is delivered onto the surface of the skin via the activity of the sebaceous gland secretions. Vitamin E has been shown to decrease aspects of inflammatory

acne when delivered to the skin surface within sebaceous secretions. Vitamin E acts as an antioxidant to inhibit lipid oxidation (free radicals) associated with acne-related inflammation. Vitamin E is known for its anti-inflammatory properties regarding its ability to decrease synthesis of inflammatory skin chemicals (eicosanoids). A recent study measured the plasma of 200 Jordanian patients and found a significant decrease in the levels of vitamins A and E in acne patients, and these decreased levels were more pronounced in those who had severe acne. In a study of 47 women and 42 men with acne vulgaris it has been shown that after 12-week supplementation of vitamin E and selenium, the skin condition improved.

**Zinc and Other Minerals** In earlier studies on the influence of zinc on human skin conducted by Michaelsson and Fitzherbert in 1970's, it was shown that acne improved with oral zinc supplementation in zinc-deficient patients. Later studies have confirmed that patients with acne often are deficient in zinc. Some vitamins have been shown to help with the inflammatory component of acne. A vitamin combination of niacinamide (nicotinamide) 750 mg, folic acid 500 mcg, zinc 25 mg and copper 1.5 mg (put in to prevent copper deficiency, which can be caused by zinc supplementation), was shown to improve acne. A precautionary note is that 750 mg of nicotinamide is a very high dose, which would require physician monitoring of liver enzymes to ensure that no liver damage occurs from the administration of such a high dose of nicotinamide.

**Pantothenic Acid (a B-vitamin).** A couple of preliminary studies have shown that the B-vitamin "Pantothenic acid" has helped to reverse acne conditions when taken at a dosage of 1,000 mg, twice daily. This is a very high dosage, which would require physician monitoring before implementing this dosage of pantothenic acid. The thinking is that pantothenic acid works by reducing the oil production of the sebaceous glands. This is done by increasing the burning of fats as a fuel, leaving fewer fats to form excess oil secretions within sebaceous glands.

**Some Supplements Can Make Things Worse.** In some cases, excess vitamin intake has also worsened acne. For instance, a few case reports show the formation of acne caused by "megadoses" of vitamins B6 and B12. These occurrences are consistent with previous reports of injectable vitamin B12 causing a monomorphic acneiform eruption.

**References: Vitamins and Minerals**

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4. [http://www.coenzyme-a.com/acne\\_vulgaris.html](http://www.coenzyme-a.com/acne_vulgaris.html)  
Pantothenic Acid in the Treatment of Acne Vulgaris  
"A Medical Hypothesis" by Lit-Hung Leung, M.D.

## **Other Supplement Considerations**

**Oil of Oregano capsules and cream:** The active ingredients in the P-73 wild oregano blend have been shown to kill many bacteria, including those associated with acne. It is best to use both the ingestible capsules and the topical cream to fight the acne bacteria from the inside and the outside of the body. This method provides a powerful synergistic action to reduce acne breakouts in uncomplicated, non-cystic acne. Oil of oregano can be used in conjunction with other acne treatments and medications in cases where concurrent therapy is being applied

## **Gum Guggul**

A controlled clinical trial found that Guggul supplements (also known as guggulsterone) outperformed standard tetracycline acne treatment. In the study, 500 mg of Gum Guggul (standardized to 2.5% guggulsterone content = 25 milligrams of guggulsterone) was taken twice daily for three months. The results showed a reduction of acne, but more importantly, 50 percent fewer participants had acne relapses, which outperformed the group given the antibiotic tetracycline. Researchers noted that patients with oily skin responded remarkably better to guggul than others in the study. A second study in 1990 noted similar benefits in acne patients. The researchers attributed the success of gum guggul treatment to its ability to reduce sebum formation and/or reduce the fatty metabolism of sebum fats by skin bacteria.

## **References:**

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### **Herbal Detoxifiers and Immune Support and Digestive Enzymes and Prebiotics**

Some skin conditions are aggravated by a build-up of impurities in the bloodstream that trigger immune inflammatory reactions that adversely affect the skin. As a way to reduce immune inflammatory reactions that may aggravate acne, it may be prudent to supplement the diet with nutrients that boost the liver's detoxification capacity and help regulate immune function. Such nutrients include, for example, a combination of milk thistle, indole-3-carbinol, Reishi mushroom extract and astragalus. It is also prudent to prevent the absorption of partially digested food matter and bacterial toxins from entering the bloodstream from the intestinal tract (problems that are associated with many skin inflammatory conditions) by supplementing with a high potency, full spectrum blend of digestive enzymes and prebiotics. This will help to improve digestion and foster the growth of the friendly gut bacteria, which in turn, improves detoxification, elimination, immune function, and has been shown to reduce inflammatory reactions throughout the body, including the reversal of some skin conditions.

### **Conventional Acne Treatment:**

Treatment of acne differs somewhat depending on the severity. Mild acne, which is most common, may be treated with simple hygiene and over-the-counter (OTC) creams or topical treatments. Treatment for mild acne may include:

- Washing gently with soap and water: Scrubbing your acne or using a harsh soap doesn't help in the treatment of acne. In fact, it may make your acne worse.
- Using Over-the-Counter (OTC) treatments: Ingredients in these treatments include benzoyl-peroxide, sulfur, resorcinol, and others.
- Practicing relaxation techniques: If you're under a lot of stress, using relaxation techniques may help speed up the healing of your acne.

If these fail, topical creams such as retinoids may need to be prescribed.

Treatment for moderate to severe acne is often treated with topical or oral prescription medications prescribed by your doctor. These include antibiotics, retinoids (derived from vitamin A), and others that your doctor may suggest.

In cases of severe acne, a dermatologist may try some of the treatments listed previously. But if those don't help, they may prescribe a medication called isotretinoin (Sotret, Claravis). This medication helps reduce severe acne. However, it does have some side effects you'll want to ask your dermatologist about. It can cause birth defects, so women who're pregnant or thinking about pregnancy shouldn't take it. This drug is a vitamin A-like derivative (**13-cis-retinoic acid**), which can cause vitamin A toxicity-related side effects.

### **Stress and Acne**

For a long time, doctors have suspected that stress worsens acne, but evidence for this was mostly anecdotal. In 2003, a Stanford University study published in the *Archives of Dermatology* found that college students had acne flare-ups during exams, a period in which they reported more stress, compared to periods without testing. Acne severity correlated highly with increasing stress, the researchers concluded. Stress does not appear to cause acne in those not prone to acne, but it appears to exacerbate acne in those who are prone to acne outbreaks. The speculation is that stress hormones (i.e. cortisol) aggravate acne in some yet undetermined way. As such, practicing stress reductions (yoga, progressive relaxation, deep breathing exercises, meditation) may be helpful to minimize acne flare-ups and frequency of break outs.

**Reference:** <https://www.webmd.com/skin-problems-and-treatments/acne/features/stress-and-acne#1>