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LET'S TAKE BACK YOUR HEALTH—*Starting Now.*



EBOOK

Nutrition for Healthy Skin

by CHRIS KRESSER

Nutrition for Skin Health

One of the biggest motivations to adopt a more nutritious diet is the desire to improve skin health. Many people of all ages struggle with skin conditions such as acne, rosacea, dry skin, wrinkles, and sun damage, among others. This can be very upsetting for those who have yet to find a solution to their problematic skin.

While conventional medical professionals often discount the connection between skin health and nutrition, there is strong evidence to support the influence of our food choices on the health and vibrancy of our skin. In this eBook, I will discuss how a nutritious whole foods diet can treat acne, wrinkles, and other problem skin conditions.

The consumption of certain vitamins, minerals, and other beneficial compounds in the diet is one of the most effective ways to treat skin conditions and improve the look and feel of one's skin. There are several nutrients that are known to play a role in the proper growth and immunity of the skin, and many people have found that their skin health has dramatically improved after making purposeful changes to their daily diet.

For example, Liz from the blog CaveGirlEats has [a great post](#) about how eating a traditional diet has improved her skin health. As her story suggests, making simple changes to your diet can have a significant impact on skin appearance in a short amount of time.

I believe that a nutrient-dense, whole foods diet, with particular attention paid to certain vitamins, minerals, and other compounds, is a powerful tool in the treatment of skin disease. It's unfortunate that many mainstream doctors and dermatologists typically deny any connection between diet and skin health, and many patients miss the opportunity to make major improvements in their skin simply by changing what they eat.

In this eBook, I will discuss how vitamins and minerals from a nutritious whole foods diet can treat acne, wrinkles, and other problem skin conditions. I hope that this eBook will give you the evidence you need to make the switch to a skin-supporting diet.

The nutrients I will discuss in this eBook are:

- Vitamin A
- Zinc
- Vitamin C
- Omega-3 Fatty Acids
- Biotin
- Selenium
- Silica
- Niacin
- Vitamin K2
- Probiotics and Gut Health
- Sulfur
- Vitamin E
- Pantothenic Acid (vitamin B5)

Vitamin A

Vitamin A, or retinol, is one of the most widely acknowledged nutrients for healthy skin. Synthetic retinoids have been used as effective treatments for severe acne and psoriasis since the 1980s, demonstrating how useful vitamin A can be in treating problem skin. Vitamin A influences the physiology of the skin by promoting epidermal differentiation, modulating dermal growth factors, inhibiting sebaceous gland activity, and suppressing androgen formation. (1) As it promotes cell turnover in the skin, vitamin A is effective in preventing the formation of comedones that cause the most common forms of acne.

Lack of vitamin A causes the skin to become keratinized and scaly, and mucus secretion is suppressed. (2) Rough, dry skin is a common sign of vitamin A deficiency, which often first appears as rough, raised bumps on the back of the arms. (3) This condition is called hyperkeratosis pilaris, and is found in approximately 40% of adults. (4) Though dermatologists believe this is an inherited condition with no cure, I have successfully treated this condition in several patients by significantly increasing their consumption of vitamin A rich foods. While physicians prescribe synthetic retinoids to treat skin conditions including acne, eczema, psoriasis, cold sores, wounds, burns, sunburn, and

ichthyosis, it is possible to obtain similar effects from consuming natural sources of preformed vitamin A. (5)

Preformed vitamin A, which is well absorbed by the body, can be found in a variety of traditional foods. The most vitamin A-rich foods are liver and cod liver oil, but other sources include kidney, cream and butter from pastured cows, and egg yolks from pastured chickens. I recommend using cod liver oil if you wish to supplement, as this provides a balance of vitamin A and vitamin D that will reduce the risk of overdosing on vitamin A. Eating liver once or twice per week is a great dietary strategy for those looking to reduce and even eliminate stubborn acne.

Zinc

Zinc is an essential mineral that is an imperative part of many physiological functions, including structure in certain proteins and enzymes, and regulation of gene expression. It plays a role in immune function, protein synthesis, wound healing, DNA synthesis, and cell division. (6) In skin, zinc assists in the proper structure of proteins and cell membranes, improves wound healing, has anti-inflammatory effects, and protects against UV radiation. (7)

Several studies indicate that dietary zinc may reduce acne, even as effectively as antibiotics such as tetracyclines. (8) This may be because it interacts with vitamin A as a component of retinol-binding protein, which is necessary for transporting vitamin A in the blood. (9) Zinc supplementation has been shown to significantly increase the level of vitamin A in the blood, indicating an interaction between the two nutrients that may explain its positive effect on acne. (10) In fact, men and women with serious acne are found to have lower levels of serum zinc than healthy controls. (11)

Dietary sources of zinc are best absorbed from animal sources, where it is not bound to phytates as in plant sources. Organs such as kidney and liver, red meat such as beef and lamb, and seafood such as oysters, scallops, and other shellfish are the highest animal sources of zinc. Plant foods such as pumpkin seeds and other nuts can also be high in zinc as well, but are less bioavailable, as the zinc is bound to phytates if not properly prepared by soaking. To get the most zinc from your diet, include shellfish, organ meats, and red meat on a regular basis.

Vitamin C

Vitamin C has been known for decades to play a crucial role in the regulation of the structural protein collagen, which is necessary for the extracellular stability of the skin. A vitamin C deficiency causes scurvy, which is first manifested as rough dry skin and corkscrew hair growth. Inadequate vitamin C is also known to contribute to the development of the common problem of hyperkeratosis pilaris, as the follicles become damaged when collagen formation is impaired.

Increasing the amount of vitamin C in the diet can contribute to improved skin health and faster healing. Observational studies have shown that diets high in vitamin C are associated with better skin appearance and less skin wrinkling. (12, 13) Vitamin C may also help prevent and treat ultraviolet (UV)-induced photodamage by acting as an antioxidant. (14) Higher intakes of dietary vitamin C have been correlated with a decreased level of dry skin, and ascorbic acid may have effects on trans-epidermal water loss. (15) Vitamin C has an important role in wound healing and can improve the proper formation of strong scar tissue. (16)

While true deficiency in the United States is uncommon, it is possible to be consuming sub-optimal levels, particularly in a diet with limited fruits and vegetables. The highest sources of vitamin C include bell peppers, guava, dark leafy greens, broccoli, brussels sprouts, kiwi, citrus fruits, and strawberries. Certain fresh herbs such as cilantro, chives, thyme, basil and parsley are also high in vitamin C. Consuming a wide variety of colorful plant foods on a regular basis is the best way to get adequate vitamin C in your diet. It's important to remember that vitamin C is sensitive to heat, so lightly cooking these plant foods or eating them raw (if possible) is ideal to maximize your intake of this vitamin.

Omega-3 Fatty Acids

Omega-3 fatty acids are known to be anti-inflammatory, and the relative intake of omega-6 to omega-3 polyunsaturated fatty acids (PUFAs) may be a crucial dietary factor in the regulation of systemic inflammation. Our modern diets tend to be very unbalanced in essential fatty acid intake; the ratio of omega-6 to omega-3 fatty acids in Western diets is commonly at least 10 to 1, compared with ratios of 4 to 1 in Japan and 2 to 1 in hunter-gatherer populations. (17) This high ratio of omega-6 to omega-3 fatty acids in our

modern diet likely plays a role in the prevalence of inflammatory skin conditions such as acne, psoriasis, and rosacea.

Increasing dietary omega-3 fats is an important step towards healing the skin. High levels of omega-3 fatty acids have been shown to decrease inflammation, and may reduce the risk of acne and other skin problems by decreasing insulin-like growth factor (IGF-1) and preventing hyperkeratinization of sebaceous follicles. (18) Conditions such as atopic dermatitis and psoriasis have been shown to be positively affected by supplementation with omega-3s from fish oil, likely due to competitive inhibition of arachidonic acid leading to a reduction in the inflammatory process. (19) Clinical results from omega-3 supplementation include an improvement in overall skin condition as well as a reduction in pruritis, scaling, and erythema. Omega-3 fatty acids have also been demonstrated to inhibit inflammation in the skin caused by UV radiation, and may even reduce the risk of skin cancer. (20)

Consuming foods rich in omega-3 fatty acids may lead to smoother, younger-looking skin with a visible reduction in inflammatory skin conditions like acne and psoriasis. These fats are especially abundant in cold water fatty fish such as sardines, salmon, mackerel, tuna, anchovies, and black cod, among many others. (21) There are many reasons I recommend [eating fish](#) rather than [taking fish oil](#) to get these omega-3s, as there are many other nutrients in fish that are highly beneficial to skin health such as vitamin D and selenium.

Avoiding industrial seed oils rich in omega-6 fatty acids can also help reduce inflammatory skin conditions; however, I have found in my clinical practice that limiting intake of omega-6 from whole foods like avocados, poultry, pork and nuts is usually not necessary. Following these recommendations and consuming adequate amounts of omega-3 fatty acids can greatly improve many inflammatory skin conditions and may help eliminate stubborn acne.

Biotin

Biotin is a water-soluble vitamin that acts as an essential cofactor for enzymes that regulate fatty acid metabolism. Proper fat production is critical for the health of the skin, since skin cells are rapidly replaced and are constantly in contact with the external

environment, and fatty acids in the skin protect the cells against damage and water loss. When biotin intake is insufficient, fat production is altered, and the skin cells are the first to develop symptoms.

A deficiency of biotin causes hair loss and a characteristic scaly, erythematous (red and inflamed) dermatitis around the mouth and other areas of the face and scalp. (22) In infants, biotin deficiency manifests as “cradle cap”, or scaly dermatitis of the scalp. This condition appears as crusty yellow or white patches on the scalp, behind the ears, and around the face. In adults, this condition is called seborrheic dermatitis and can occur in many different areas of the skin. Biotin deficiency can also be a cause of dandruff for some people.

While true biotin deficiency is rare, consuming adequate amounts of biotin can help prevent problems with dry skin and seborrheic dermatitis. Biotin deficiency in the diet is usually only seen in individuals who are consuming raw egg whites, due to the protein avidin which binds with biotin and prevents its absorption in the gut. (23) Therefore, it's not a good idea to eat raw egg whites, and if biotin deficiency is a concern, be sure to consume adequate amounts of biotin rich foods. The best sources of biotin are egg yolks and liver, and other good sources include swiss chard, romaine lettuce, almonds, and walnuts. Including these foods in your diet will prevent biotin deficiency and may help improve the production of fatty acids in the skin, returning moisture to dry skin.

Sulfur

Sulfur, the third most abundant mineral in the human body, is an extremely important dietary compound for both skin health and overall wellness. Yet we rarely hear about sulfur in mainstream nutrition, and many people do not even know which foods provide it. In fact, a large proportion of our population is likely eating a diet deficient in sulfur, which could be causing the initiation and progression of many inflammatory and degenerative diseases. (24) While the benefits of a diet rich in sulfur are numerous, I will focus on the effect consuming adequate sulfur can have on the health of the skin.

Sulfur is necessary for collagen synthesis, which gives the skin its structure and strength. The breakdown of collagen or insufficient production of collagen as we age is one of the major contributors to the development of wrinkles, and dietary sulfur significantly affects

the production of collagen in our skin. Animals fed a sulfur deficient diet produce less collagen than normal, demonstrating how a diet with inadequate sulfur can contribute to a reduction in collagen and subsequently cause an increase in skin wrinkling. (25)

Getting enough sulfur in your diet can help maintain collagen production and keep your skin looking firm.

Sulfur is also required for the synthesis of glutathione, one of the most important antioxidants in the body. High levels of glutathione in the body can prevent damage caused by free radicals, which are thought to be the major cause of cellular aging. (26) The free radical theory of aging suggests that aging results from accumulation of cellular damage from excess reactive oxygen species that are generated as a consequence of oxidative metabolism. High levels of glutathione in the body can reduce the damage caused by these reactive oxygen species, helping to slow down the visible signs of aging. Glutathione also regulates the production of prostaglandins, reducing inflammation and possibly affecting symptoms of inflammatory skin conditions. (27) The level of glutathione in the body is greatly impacted by having adequate sulfur, specifically sulfur-containing amino acids, in the diet. (28, 29)

These amino acids are most abundant and bioavailable in animal foods such as egg yolks, meat, poultry, and fish. (30) Sulfur is also found in plant foods; good sources include garlic, onions, brussels sprouts, asparagus, and kale. Fermentation may make this sulfur more bioavailable, so foods like sauerkraut and other fermented crucifers are excellent sources of sulfur and an important component of a diet for healthy, youthful skin.

Silica

While silica may not be considered an essential nutrient by current standards, it is likely that this trace mineral plays a functional role in human health. (31) In animals, a silica deficient diet has been shown to produce poorly formed connective tissue, including collagen. In fact, silica has been shown to contribute to certain enzyme activities that are necessary for normal collagen formation. Silica is essential for maintaining the health of connective tissues due to its interaction with the formation of [glycosaminoglycans](#) (GAGs), which are structural building blocks of these types of tissue. One well-known GAG important for skin health is hyaluronic acid, which has been shown to promote skin

cell proliferation and increase the presence of retinoic acid, improving the skin's hydration. (32)

Therefore, a deficiency in silica could result in reduced skin elasticity and wound healing due to its role in collagen and GAG formation. As we know, proper collagen formation is essential for maintaining tight, wrinkle-free skin, so silica can also be beneficial for slowing down the signs of skin aging. It's best to get silica from natural sources, and food sources of silica include leeks, green beans, garbanzo beans, strawberries, cucumber, mango, celery, asparagus and rhubarb. (33)

Silica can also be found in certain types of water, such as [Fiji brand water](#), which contains more than four times the levels found in other bottled waters due to the leaching of water-soluble silica from volcanic rock. (34) In fact, beverages contribute to more than half of the total dietary intake of silica, and the silica content of water depends entirely on its geological source. Silica can also be found in trace mineral supplements, such as [ConcenTrace Trace Mineral Drops](#), which can be added to plain drinking water.

Niacin

Niacin, also known as vitamin B3, plays a vital role in cell metabolism as a coenzyme in energy producing reactions involving the breakdown of carbohydrates, fats, and proteins, as well as anabolic reactions such as fatty acid and cholesterol synthesis. (35) The deficiency of niacin is rare these days, but was fairly common historically due to the reliance on niacin-poor food staples, such as corn and other cereal grains, in low-income communities. (36) Pellagra, the disease of late stage niacin deficiency, causes a variety of skin symptoms such as dermatitis and a dark, scaly rash. In fact, the word "pellagra" comes from the Italian phrase for rough or raw skin. (37) The skin symptoms are often the first to appear, and may be exacerbated by even a slight deficiency in niacin over a long period of time.

While a low intake of niacin is unlikely, there are some diseases that may cause inadequate niacin absorption from the diet. An example of this is in celiac disease, where absorption is impaired by the swelling and thickening of the intestinal lining that occurs in celiac disease. (38) Other inflammatory gut conditions such as IBS or Crohn's disease can

also lead to a reduction in niacin absorption, and could conceivably lead to the skin-related symptoms of pellagra such as dermatitis and scaling.

Good whole-foods sources of niacin include meat, poultry, red fishes such as tuna and salmon, and seeds. Milk, green leafy vegetables, coffee, and tea also provide some niacin to the diet. Your liver can also convert tryptophan from high-protein foods like meats and milk into niacin. (39) In the case of true deficiency, supplementation may be necessary, but for most healthy people, a varied diet with adequate meat consumption should be enough to meet one's nutritional needs. If choosing to supplement, be sure to consult with a licensed medical professional, as too much nicotinic acid can be harmful.

Vitamin K2

I've written before about the incredible [health benefits](#) of a diet rich in vitamin K2. Vitamin K2's role in the body includes protecting us from heart disease, forming strong bones, promoting brain function, supporting growth and development and helping to prevent cancer – to name a few. It performs these functions by helping to deposit calcium in appropriate locations, such as in the bones and teeth, and prevent it from depositing in locations where it does not belong, such as the soft tissues. One of the health benefits of vitamin K2 not often discussed is its role in ensuring healthy skin, and this vitamin is likely beneficial for preventing wrinkling and premature aging.

Adequate dietary vitamin K2 prevents calcification of our skin's elastin, the protein that gives skin the ability to spring back, smoothing out lines and wrinkles. (40) This is because K2 is necessary for activation of matrix proteins that inhibit calcium from being deposited in elastin fibers and keeping these fibers from hardening and causing wrinkles. In fact, recent research suggests that people who cannot metabolize vitamin K end up with severe premature skin wrinkling. (41) Vitamin K2 is also necessary for the proper functioning of vitamin A- and D- dependent proteins. As I discussed earlier, vitamin A is essential for proper skin cell proliferation, and cannot work properly if vitamin K2 is not available. Therefore, vitamin K2 is important in the treatment of acne, keratosis pilaris, and other skin symptoms of vitamin A deficiency.

It's important to get adequate amounts of dietary vitamin K2, particularly if trying to heal the skin or prevent wrinkles. Great sources of vitamin K2 include butter and other high fat

dairy products from grass-fed cows, egg yolks, liver, and natto. Fermented foods such as sauerkraut and cheese are also quite high in vitamin K2 due to the production of this vitamin by bacteria. It is important to note that commercial butter and other dairy products are not significantly high sources of vitamin K2, as most dairy cattle in our country are fed grains rather than grass. It is the grazing on vitamin K1-rich grasses that leads to high levels of vitamin K2 in the dairy products of animals, so be sure to look for grass-fed dairy products when trying to increase your intake of vitamin K2. (42) A great all-around supplement for skin health is Green Pasture's [Fermented Cod Liver Oil and Butter Oil blend](#). It has a great mix of vitamins A, D, K2, and omega-3s in the proper ratios to help maximize skin health, especially in people with acne.

Probiotics

Probiotics are one of the most fascinating areas of modern nutrition research, and a topic I am passionate about. The “skin-gut axis” has been studied since the 1930s, and yet we’re only just beginning to understand the role that probiotics may play in skin health. The ability of the gut microbiota and oral probiotics to influence systemic inflammation, oxidative stress, glycemic control, and tissue lipid content, may have important implications in skin conditions such as acne, rosacea, atopic dermatitis, and psoriasis. (43)

Recent studies have shown that orally consumed pre and probiotics can reduce systemic markers of inflammation and oxidative stress, which may help reduce inflammatory acne and other skin conditions. (44, 45, 46) There is also a connection between small intestine bacterial overgrowth (SIBO) and the incidence of acne, suggesting that reestablishing the proper balance of gut microflora is an important factor in treating acne.

I believe the evidence strongly supports the role of probiotics in treating a variety of skin conditions, and recommend that anyone suffering from skin trouble be especially diligent about including fermented foods such as sauerkraut, kimchi, yogurt, and kefir in your regular diet.

Probiotic supplements can also be helpful—but be careful, because not all probiotics will be beneficial for skin conditions. As I’ve mentioned, many people with skin conditions

also have SIBO. SIBO often involves an overgrowth of microorganisms that produce a substance called D-lactic acid. Unfortunately, many commercial probiotics contain strains (like *Lactobacillus acidophilus*) that also produce D-lactic acid. That makes most commercial probiotics a poor choice for people with SIBO.

Soil-based organisms do not produce significant amounts of D-lactic acid, and are a better choice for this reason. In my clinic, I have great success with a product called Prescript Assist when treating skin conditions. You can purchase it [here](#). Other popular choices include Gut Pro from Organic 3 and D-Lactate Free Powder from Custom Probiotics. I used these in the past, but have much better success with Prescript Assist so I now use that exclusively.

Associations between gut disorders and skin conditions

Epidemiological evidence shows a clear association between gut problems and skin disorders. A recent report indicated that small intestine bacterial overgrowth (SIBO), a condition involving inappropriate growth of bacteria in the small intestine, is 10 times more prevalent in people with acne rosacea than in healthy controls, and that correction of SIBO in these individuals led to marked clinical improvement. (47) 14% of patients with ulcerative colitis and 24% of patients with Crohn's disease have skin manifestations. (Interestingly enough, a [study just came out](#) showing that a drug normally used to treat psoriasis is also effective for Crohn's disease.) Celiac disease also has cutaneous manifestations, such as dermatitis herpetiformis, which occurs in 1/4 of celiac sufferers. Celiacs also have increased frequency of oral mucosal lesions, alopecia and vitiligo. (48)

Intestinal permeability (a.k.a. "leaky gut") causes both systemic and local inflammation, which in turn contributes to skin disease. In a study way back in 1916, acne patients were more likely to show enhanced reactivity to bacterial strains isolated from stool. 66 percent of the 57 patients with acne in the study showed positive reactivity to stool-isolated bacteria compared to none of the control patients without active skin disease. 1 In a more recent study involving 80 patients, those with acne had higher levels of and reactivity to lipopolysaccharide (LPS) endotoxins in the blood. None of the matched healthy controls reacted to the *e. coli* LPS, while 65% of the acne patients had a positive

reaction. Both of these studies suggest that increased intestinal permeability is an issue for a significant number of acne patients. (49)

Speaking of permeable barriers: most of you have heard of leaky gut by now, but what about “leaky skin”? The main function of the skin is to act as a physical, chemical and antimicrobial defense system. Studies have shown that both stress and gut inflammation can impair the integrity and protective function of the epidermal barrier. This in turn leads to a decrease in antimicrobial peptides produced in the skin, and an increase in the severity of infection and inflammation in the skin. (50)

The gut flora also influences the skin. Substance P is a neuropeptide produced in the gut, brain and skin that plays a major role in skin conditions. Altered gut microbiota promotes the release of substance P in both the gut and the skin, and probiotics can attenuate this response. (51) The gut microbiota influences lipids and tissue fatty acid profiles, and may influence sebum production as well as the fatty acid composition of the sebum. (52) This may explain why a Russian study found that 54% of acne patients have significant alterations to the gut flora (53), and a Chinese study involving patients with seborrheic dermatitis also noted disruptions in the normal gut flora. (54)

Another line of evidence suggesting a connection between the gut and skin is the observation that probiotics improve skin conditions. Oral probiotics have been shown to decrease lipopolysaccharide, improve intestinal barrier function and reduce inflammation. The first formal case report series on the value of using lactobacilli to treat skin conditions was published in 1961 by a physician named Robert Siver. He followed 300 patients who were given a commercially available probiotic and found that 80 percent of those with acne had some clinical improvement. (55)

In a more recent Italian study involving 40 patients, *Lactobacillus acidophilus* and *Bifidobacterium bifidum* in addition to standard care led to better clinical outcomes than standard care alone. (56) And another recent study of 56 patients with acne showed that the consumption of a *Lactobacillus* fermented dairy beverage improved clinical aspects of acne over a 12-week period. (57)

The beneficial effect of probiotics on skin may explain why pasteurized, unfermented dairy is associated with acne, but fermented dairy is not. I haven't seen any studies on

raw dairy and skin conditions, but my guess is that it wouldn't be associated either. Orally consumed probiotics reduce systemic markers of inflammation and oxidative stress, both of which are elevated locally in those with acne. (58) Oral probiotics can also regulate the release of pro-inflammatory cytokines within the skin. (59) The fermentation of dairy reduces levels of insulin-like growth factor 1 (IGF-1) by more than four-fold. (60) This is significant because studies show that acne is driven by IGF-1, and IGF-1 can be absorbed across colonic tissue. (61) This would be particularly problematic when increased intestinal permeability is present, which as I mentioned above is often the case in people with acne.

Vitamin E

Vitamin E is the most abundant fat-soluble antioxidant found in the skin. It is secreted on the skin surface through the sebum, an oily substance that coats the outer layer of the skin. (62) This secretion happens roughly 7 days after consumption of vitamin E-rich foods, and is an important protective factor on the skin's surface. Our bodies store vitamin E in our fat cells, and we depend on adequate dietary intake to keep these levels optimum.

Vitamin E is a potent anti-inflammatory agent, defending the skin against free radicals and reactive oxygen species that would otherwise cause damage. (63) Vitamin E may also play a synergistic role with selenium in improving glutathione levels in the body, further increasing antioxidant activity. (64) Adequate levels of this vitamin in the skin may prevent inflammatory damage from sun exposure, helping to reduce the aging and skin cancer risk from excessive UV radiation.

Vitamin E is also involved in immune function and cell signaling, regulation of gene expression, and other metabolic processes. (65) It even suppresses the formation of arachidonic acid, which could help improve inflammatory skin conditions such as atopic dermatitis and psoriasis. (66, 67)

Good sources of vitamin E that are Paleo-friendly can sometimes be difficult to find; most Americans get the majority of their vitamin E from polyunsaturated vegetable oils like soybean, canola, corn, and other vegetable oils. (68) Whole food sources of vitamin E include spinach, turnip greens, chard, sunflower seeds, almonds, bell peppers,

asparagus, collards, kale, broccoli, and brussels sprouts. Olive oil contains a moderate amount of vitamin E as well. It is important to eat these foods with plenty of fat to boost the absorption of vitamin E, which is a fat-soluble vitamin. While grass-fed meat may be higher in vitamin E than conventional meat, animal foods are generally a poor source of this antioxidant, so be sure to consume plenty of leafy greens as part of your healthy skin diet. (69)

I do not recommend supplementing with vitamin E in most cases. Studies have shown that long-term supplementation with alpha-tocopherol, the form of vitamin E found in most multivitamins, may increase the risk of cardiovascular disease. (70) This should serve as a reminder that supplementing with isolated, synthetic nutrients affects the body differently than obtaining the same nutrients from whole-food sources.

Pantothenic Acid (B5)

Pantothenic acid, also called vitamin B5, is a water-soluble vitamin named after the Greek word *pantos*, meaning “everywhere.” This is due to the vitamin’s presence in virtually all types of food, and its requirement by nearly every type of organism for proper growth and metabolic function. Pantothenic acid plays a role in a wide variety of biological activities, including energy production and protein and fat synthesis, and is needed by many different types of skin cells for proper regeneration and growth.

Pantothenic acid has been shown to support wound healing, especially when applied topically, by improving the regrowth of those cells that are responsible for generating connective tissue after injury. (71) This vitamin may also promote the growth and differentiation of keratinocytes, which are essential for maintaining a healthy barrier function in the skin. (72) Keratosis pilaris, or “chicken skin”, is a common skin condition caused by impaired keratinocyte growth, which may benefit from increased pantothenic acid consumption.

Pantothenic acid also significantly increases levels of glutathione in the cells, which acts as a potent antioxidant in the skin. (73, 74) As I mentioned earlier in this eBook, increased levels of glutathione in the skin protects against oxidative damage of cell membranes, reducing the effects of sun damage, pollutants, and other stressors. This can help reduce the signs of aging, prevent wrinkles, and even defend against skin cancer.

Pantothenic acid is available in a variety of foods, but the richest sources are liver and kidney, egg yolk, and broccoli. Fish, shellfish, chicken, dairy products, mushrooms, avocado, and sweet potatoes are also good sources. Most healthy people have no problem meeting their pantothenic acid requirements, but factors such as stress, pregnancy, and a diet high in processed foods can increase one's needs for this vitamin. (75) High heat, canning, and other processing methods may reduce the amount of pantothenic acid in food by up to 75%, so it's important to consider cooking and preparation of these foods when trying to maximize your intake of pantothenic acid. (76)

Selenium

Selenium is an incredibly important trace mineral with numerous health benefits, yet many people may be at risk for deficiencies of this important element. (77) Poor levels of selenium in the soil, inadequate intake, and intestinal disorders that affect absorption can all lead to minor deficiencies, and this can have consequences for general health as well as the health of the skin. (78, 79)

One of the most important functions of selenium is as a component of glutathione peroxidase, an enzyme necessary for the antioxidant function of glutathione. As I've mentioned before, glutathione is one of the major antioxidants in the body that protects against cellular damage from the free radicals that cause inflammation, aging, and promote skin cancer. In fact, many scientists support the theory that selenium in the diet is protective against skin cancer: epidemiological evidence suggests that death rates from cancer are significantly lower in areas of the world where selenium levels in the soil are high, and some clinical trials have shown benefits of dietary selenium in cancer prevention. (80, 81)

Selenium-dependent glutathione peroxidase and its effects on glutathione activity may also have a significant role in acne severity. Patients with acne have been shown to have low levels of blood selenium, as well as low levels of selenium-dependent glutathione activity. (82, 83) Clinical research has shown that selenium supplementation, along with vitamin E, improves the appearance of acne while simultaneously increasing glutathione activity in those patients with lower levels. (84)

In addition, selenium and vitamin E likely play complementary roles in increasing glutathione activity and reducing overall oxidative stress in the body. Therefore, a diet high in selenium is likely to improve acne, specifically in those with low levels of glutathione.

It's best to get your selenium from food, and the richest sources of this trace element are organ meats and seafood, followed by muscle meats. Fish such as cod, tuna, halibut, sardines, and salmon are excellent sources, along with liver and meats like beef, turkey, and lamb. Brazil nuts are also a rich in selenium, and just two brazil nuts a day will give you the 200 micrograms necessary for an adequate intake. The selenium content of food depends heavily on soil conditions, so eating a range of selenium-rich foods on a regular basis will ensure that you're getting enough – no need to worry about eating too much. (85)

That said, while the above study indicates that there may be no upper limit for selenium in the diet, other studies have shown that selenium is potentially toxic in high doses. 400 mcg per day and/or blood levels of 1,000 ng/mL are currently recognized as the safe upper limit. (86) Therefore, if you are eating selenium-rich foods I do not recommend taking more than 200 mcg/d in supplemental form.

Conclusion: Diet DOES Impact Your Skin!

I believe that a nutrient-dense, whole foods diet, with particular attention paid to certain vitamins, minerals, and other compounds, is a powerful tool in the treatment of skin disease. It's unfortunate that many mainstream doctors and dermatologists typically deny any connection between diet and skin health, and many patients miss the opportunity to make major improvements in their skin simply by changing what they eat. I hope that this eBook has given you the evidence you need to make the switch to a skin-supporting diet.

As a quick recap, the top whole-foods nutrients I recommend as part of any skin-healing diet are:

- Vitamin A
- Zinc

- Vitamin C
- Omega-3 Fatty Acids
- Biotin
- Selenium
- Silica
- Niacin
- Vitamin K2
- Probiotics
- Sulfur
- Vitamin E
- Pantothenic Acid (vitamin B5)

For additional information, check out my book: [The Paleo Cure](#). There's an entire bonus chapter specifically dedicated to treating skin conditions. I discuss the diet, lifestyle and supplements I recommend to patients that I treat with these conditions. You can order a copy [here](#).