

The Effects of Biotin on Your Hair, Nails and Thyroid

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STORY AT-A-GLANCE

- › Dermatologists frequently prescribe biotin for people with hair loss, despite a paucity of research proving it helps
- › Biotin insufficiency is more rare than other nutritional deficiencies but it does happen, leading to hair loss, depression, loss of appetite and numbness and tingling
- › Biotin is important in metabolism, having demonstrated the ability to improve glycemic control and strengthen nails
- › Supplementation can alter blood tests, including for thyroid, vitamin D and troponin, a marker of cardiac health

This article was previously published July 20, 2020, and has been updated with new information.

Your body uses vitamins for normal cell functioning; Essential vitamins must be consumed because they cannot be manufactured by the cells. Vitamins are grouped into two categories: fat soluble and water soluble.¹ The fat soluble types get stored in fatty tissue and absorbed when eaten with dietary fat.

Water soluble vitamins are not stored by your body. Instead, excessive amounts are excreted through the urine. This means that essential water-soluble vitamins must be consumed on a regular basis to prevent any shortages. Vitamin B7, colloquially called biotin, is a water-soluble vitamin your body uses for energy metabolism.

Vitamins have different jobs within the body, including supporting your immune system, neurological system and energy metabolism. Biotin is a cofactor for an enzyme that is crucial in the metabolism of glucose, fatty acids and amino acids. It is also used in the production of hormones and cholesterol.²

Cholesterol is a fat-like substance that's required in the right amounts for good health. Your body uses about 1,000 mg of cholesterol every day to synthesize hormones and vitamin D and to make cell membranes and the myelin sheath, which surrounds nerve cells.³ Without adequate biotin, your body can't make enough cholesterol.

What's Behind Your Hair Loss?

Despite a lack of research to support the idea that biotin may help address hair loss or improve skin and nail health, dermatologists have been prescribing it for years.⁴ Studies published in 2016⁵ and 2017⁶ included results having to do with the use of biotin to help thinning hair.

Although it was helpful when prescribed to those with a biotin deficiency, it didn't appear to be useful in others. In the study published in 2016, researchers assessed patients from the Center for Dermatology and Hair Diseases who arrived with complaints of hair loss. They found that 38% of the women also had a biotin deficiency.

The most common type of hair loss in women and men is androgenetic alopecia.⁷ Men lose it at the front and vertex of the head, with thinning along the sides over the ear. Women start with diffuse thinning at the vertex.

By age 50, 50% of men will experience what is commonly called male pattern baldness. Interestingly, malnutrition, iron deficiency anemia and thyroid disease are also linked to hair loss. Other reasons for loss can include telogen effluvium, when the hair is lost in moderate amounts after a major body stress. Side effects from some drugs, medical illness and a fungal infection of the scalp can also cause hair loss.⁸

Yet, dermatologist Dr. Wilma Bergfeld from Cleveland Health Clinic finds that one of the most common causes is poor nutrition, more specifically the lack of essential vitamins.

She says dermatologists start their detective work with a thorough physical exam and medical history, including family records and information on each patient's diet, exercise and medications. She commented:⁹

"If your hair is falling out at the roots, often something is going wrong in your body or in your life situation. We find biotin to be very helpful for hair disorders. It also makes nails thicker, and oral biotin is exceedingly safe, even in large doses. Biotin improves hair growth and helps with inflammation. The hair follicle, the skin and the nails all benefit."

Common Signs of Insufficiency

Insufficiency of this B vitamin is more rare than other nutritional deficiencies, but it can still occur. Since the body does not store it, your nutrient intake must be consistent. Some of the common signs of insufficiency include hair loss, brittle nails and a red, scaly rash around the eyes, nose, mouth and genitals. Other symptoms may include:¹⁰

- Depression
- Loss of appetite or nausea
- Tingling in the extremities
- Numbness
- Hallucinations

Several of the symptoms of biotin insufficiency are neurological in nature. Researchers also suggest that biotin supplementation may be helpful in the treatment of multiple sclerosis (MS). It's crucial in the development of the myelin sheath, which gets damaged or destroyed in MS. In one study, scientists concluded, "These preliminary data suggest that high doses of biotin might have an impact on disability and progression in progressive MS."¹¹

Dr. Bruce Cree is a neurologist from the University of California San Francisco. He has a special interest in the disease and commented on a study of a pharmaceutical grade

biotin treatment for MS:¹²

"Taken together, these studies are very promising and provide hope for a condition that has thus far been largely intractable using treatments targeting neuro-inflammation. That the extension study from the SPI trial showed an apparent durability of effect suggests that high dose biotin may have disease modifying properties in addition to its proposed role in enhancing energy metabolism.

Furthermore, the positive impact of high dose biotin points to a new line of inquiry in understanding the pathophysiology of progressive MS."

Deficiency can happen with prolonged parenteral feedings that are not supplemented with vitamin B7. Individuals who eat raw egg whites for long periods of time can also experience deficiency, since the egg whites contain a type of protein called avidin, which binds with biotin,¹³ thus preventing the body from absorbing the nutrient.¹⁴

Biotin Brings the Good Stuff

Biotin plays a role in metabolic function and the metabolism of carbohydrates and amino acids. The breakdown of these nutrients helps create energy. In one study of 447 people with poorly controlled Type 2 diabetes, researchers added chromium picolinate with biotin for 90 days.¹⁵

When compared to the control group who received a placebo, the intervention group showed a reduction in their hemoglobin A1c by 0.54%. Fasting glucose levels were also lower, suggesting the combination may be a successful adjuvant to medication prescribed for glycemic control.

In a second, more recent study, researchers found that the synergistic effect with chromium picolinate is well-tolerated.¹⁶ Biotin has also been tested in people with Type 1 diabetes. Scientists believe it may have the potential to slow hepatic steatosis and control diabetic neuropathy and nephropathy.¹⁷

As you might expect, since a biotin deficiency can lead to brittle nails, adding extra biotin to the diet may help strengthen them. In an animal study, researchers looked at in vitro lab results involving animal claws and hooves. They used biotin as treatment for nail disorders and found "Several observations in animals and cells lines led to the hypothesis that biotin could be used to treat human nails."¹⁸

Although supplementation with biotin rapidly clears skin rashes associated with the vitamin deficiency, there is no scientific evidence that it can improve everyone's skin health.¹⁹ There is evidence that both deficiency and overload can adversely affect a growing baby. Women who are pregnant should consult their OB/GYN.

Supplements May Alter Thyroid Tests

The Food and Nutrition Board has not established the upper limits for biotin supplementation.²⁰ In 1998, scholars from the National Academy of Sciences gathered information from clinical observations and studies in which biotin deficiency was induced.²¹ Factors they identified that affect an individual's body requirement include the ingestion of raw egg whites, genetic defects, anticonvulsants and pregnancy.

They found no adverse effects associated with a high intake of biotin in humans or animals. People taking up to 200 milligrams by mouth each day did not have any signs of toxicity. However, based on results from an animal study, they did find that taking doses of biotin during pregnancy can inhibit placental growth and increase the risk of miscarriage.

The doses used in the study were higher than those that are frequently recommended and they were not found to be useful in determining an upper intake level for humans. The Harvard TH Chan School of Public Health reports that an upper limit for biotin has still not been established as there aren't negative effects noted with high intakes.²²

However, even taking a low dose can interfere with diagnostic blood tests commonly used to measure hormones, such as your thyroid hormone. It can also alter results of

vitamin D tests.²³ This can be crucial in optimizing your vitamin D level before the fall flu season and the expected second wave of COVID-19.

Taking biotin before a thyroid test has resulted in false diagnoses of Graves' disease and severe hypothyroidism. A single 10 mg dose taken 24 hours before a thyroid function test can taint the results. The FDA published a warning in 2017 that biotin could interfere with lab tests.²⁴

They received a report of an individual who died following a troponin test, which had been done for markers of cardiac health. The individual had been taking high levels of biotin and the test revealed a false negative, resulting in no treatment following a heart attack.

Biotin can also interact with medications, and some medications can lower biotin levels. For instance, anticonvulsant treatments can significantly lower biotin, which may happen by increasing catabolism of biotin and inhibiting absorption.²⁵

Start With Biotin-Rich Foods

The best way to get your biotin is through whole food, especially if you are concerned about a supplement altering your test results. However, if you steer clear of taking excessive amounts and stop taking supplements at least 24 hours before a blood test, biotin supplements can be safe. It's important to let your physician know you are taking supplements if you must have an emergency blood test.

There are two forms of biotin found in food. The first is free biotin, found in plants. The second is protein-bound in protein-based animal foods. The free version is more readily absorbed, but your body can use both forms. Foods high in free biotin include:^{26,27}

- Almonds
- Sunflower seeds
- Spinach and broccoli
- Carrots, onions and cauliflower

- Sweet potatoes

Protein-bound biotin is found in:

- Organic, free-range/pastured eggs yolks
- Organ meats such as liver and kidneys
- Dairy products such as milk, butter and cheese (ideally organic raw milk from grass fed cows)
- Seafood (just make sure it's low in mercury and other contaminants, and wild-caught, not farmed)

One of the best sources of biotin is pastured egg yolk. Cooking the egg white deactivates the avidin, which means eating cooked eggs will not lead to a biotin deficiency. If you choose to take a biotin supplement for hair loss, the Cleveland Clinic dermatologists recommend a mega-B combination:

- 3 milligrams of biotin
- 30 milligrams of zinc
- 200 milligrams of vitamin C
- <1 milligram of folic acid

Bergfeld notes, "Occasionally, the mega B-vitamin combination gives some patients minor gastric trouble but switching them to biotin alone relieves it."²⁸

Sources and References

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