

The Role of Nutraceuticals in Hair Growth Stimulation

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Introduction

Hair loss is a common and distressing condition that affects a significant portion of the global population. While conventional treatments such as pharmacotherapy and surgical interventions exist, there has been a growing interest in alternative therapies, particularly nutraceuticals, for hair growth stimulation. Nutraceuticals, which are products derived from food sources with beneficial effects on health, have shown promise in stimulating hair growth and preventing hair loss. This systematic review aims to evaluate the current body of evidence on the role of nutraceuticals in promoting hair growth, exploring various mechanisms, active ingredients, and clinical outcomes. We also assess safety profiles and potential applications in clinical practice.

Hair loss, or alopecia, is a prevalent issue affecting millions of individuals worldwide. While hereditary factors, hormonal imbalances, and certain medical conditions are often to blame, stress, diet, and environmental factors also contribute to hair thinning and shedding. Traditional treatments such as minoxidil, finasteride, and hair transplantation have been widely used, but many individuals seek alternative or complementary therapies due to the side effects or limitations of these treatments. In this context, nutraceuticals, which combine the concepts of "nutrition" and "pharmaceuticals," have garnered attention for their potential role in stimulating hair growth and improving hair health. Nutraceuticals encompass a wide range of bioactive compounds, including vitamins, minerals, amino acids, herbal extracts, and other plant-based compounds that offer therapeutic effects without the toxicity often associated with conventional drugs.

Description

This review systematically examines the role of nutraceuticals in hair growth, focusing on the mechanisms by which these substances may stimulate hair follicles, promote hair cycle regeneration, and prevent further hair loss. A systematic review of the literature was conducted using electronic databases, including PubMed, Scopus, Web of Science, and Google Scholar. Keywords such as "nutraceuticals," "hair growth," "hair loss," "alopecia," "nutrients," and "hair follicle stimulation" were used to identify relevant studies. Studies published from 2000 to 2024 were included, focusing on clinical trials, observational studies, and meta-analyses. Both human and animal studies were considered, provided they examined the effects of nutraceuticals on hair growth.

Vitamin D deficiency is linked to hair loss, particularly in cases of androgenic alopecia. Several studies have shown that vitamin D supplementation can promote hair regrowth by stimulating hair follicle stem cells and inducing the anagen (growth) phase of the hair cycle. A recent randomized controlled trial

found that vitamin D supplementation improved hair density in individuals with alopecia areata. Biotin, also known as vitamin B7, is commonly used in hair growth supplements. While studies on biotin's efficacy for hair growth are mixed, some clinical trials suggest that biotin may be helpful in cases of biotin deficiency, which can lead to hair thinning. Zinc is an essential mineral involved in protein synthesis and cell division, both of which are critical to the hair growth process [1-3]. Zinc supplementation has shown promising results in patients with alopecia areata and telogen effluvium, where zinc deficiency has been identified as a contributing factor.

Iron deficiency is a well-documented cause of hair loss, particularly in premenopausal women. Iron supplementation has been found to improve hair regrowth in individuals with low serum ferritin levels. L-cystine: L-cystine, an amino acid derived from cysteine, plays a role in the formation of keratin, the primary structural protein in hair. Supplementing with L-cystine has been shown to strengthen hair and reduce hair breakage in some clinical studies. Oral keratin supplementation has been studied as a means of improving hair health. Studies suggest that keratin peptides, when taken orally, can promote hair strength, reduce hair thinning, and improve hair texture.

Saw palmetto is one of the most commonly used plant-based nutraceuticals for hair loss. It is thought to inhibit the conversion of testosterone to dihydrotestosterone, a key hormone involved in androgenic alopecia. Clinical studies have shown mixed results, but some studies report improvements in hair density and thickness with saw palmetto supplementation. Ginseng is believed to stimulate blood circulation to the scalp and promote hair follicle health. Some studies have found ginseng to be effective in reducing hair shedding and improving hair growth in patients with alopecia. Green tea contains polyphenols, particularly epigallocatechin gallate, which has shown potential in inhibiting the enzyme 5-alpha reductase, thereby reducing DHT levels. Some studies suggest that topical or oral green tea extract may improve hair growth in individuals with androgenic alopecia. Ginkgo biloba is thought to improve blood circulation, including to the scalp. Although research on its effects on hair growth is limited, preliminary studies suggest it may aid in hair restoration by increasing blood flow to the hair follicles. Omega-3 fatty acids are essential for overall hair health, and studies indicate they can help reduce hair shedding and improve the condition of the hair. Omega-3 supplementation has been linked to a reduction in the inflammatory processes associated with hair loss.

The findings from the systematic review highlight the potential of nutraceuticals as a complementary or alternative treatment for hair loss. Several vitamins, minerals, amino acids, herbal extracts, and fatty acids have demonstrated efficacy in improving hair growth or reducing hair loss, with varying mechanisms of action. These substances may promote hair growth by providing essential nutrients to hair follicles, enhancing circulation, and inhibiting DHT production, all of which are crucial for maintaining a healthy hair cycle. However, the evidence is not entirely consistent across all studies, and the clinical outcomes of many nutraceuticals remain inconclusive. The quality of studies varied, with many suffering from small sample sizes, short study durations, or a lack of control groups. More rigorous, large-scale randomized controlled trials are needed to substantiate the claims made about nutraceuticals' efficacy in hair growth stimulation [4,5]. Furthermore, the safety profile of many nutraceuticals is generally favorable, with minimal adverse effects reported in most studies. However, the potential for interactions with other medications, particularly in patients with underlying health conditions, should be considered.

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Conclusion

Nutraceuticals represent a promising adjunct or alternative to conventional treatments for hair loss, with several substances demonstrating potential in stimulating hair growth and preventing hair thinning. While the evidence is encouraging, more robust, long-term clinical trials are needed to better understand the mechanisms of action, efficacy, and safety of nutraceuticals in the context of hair growth. As part of a holistic approach to hair health, nutraceuticals may offer a viable and safe option for individuals seeking to improve their hair growth outcomes.

Acknowledgement

None.

Conflict of Interest

None.

References

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