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Exploring Phytotherapy For Alopecia: Efficacy, Mechanisms, And Future Directions

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Abstract

Alopecia, a condition characterized by hair loss, affects a significant portion of the population and has various psychological and physical impacts. This review article explores the efficacy and safety of herbal treatments for alopecia, integrating traditional knowledge with contemporary scientific research. The article examines various herbal remedies used across cultures, such as *Saw Palmetto*, Ginseng, Green Tea, and *Phyllanthus Emblica*, delving into their bioactive compounds and mechanisms of action. Studies and case reports, adhering to APA citation style, highlight the potential of these natural remedies in promoting hair growth and managing different types of alopecia. The review also addresses the safety profile and toxicological considerations of these herbal treatments, underscoring the importance of comprehensive evaluations and standardized dosages. The integration of herbal treatments with conventional therapies is discussed as a promising avenue for enhancing treatment outcomes. The article concludes by emphasizing the need for more rigorous clinical trials, exploration of new herbal compounds, and the development of standardized, safe herbal formulations for alopecia treatment.

Keywords: Alopecia, Herbal Treatments, Hair Loss, Saw Palmetto, Ginseng, Green Tea, Phyllanthus Emblica, Bioactive Compounds, Safety Profile, Toxicological Evaluation, Integrative Therapy, Clinical Trials.

INTRODUCTION

Background on Alopecia

Alopecia, commonly known as hair loss or baldness, encompasses a range of conditions characterized by the thinning or loss of hair from parts of the body, typically the scalp. It can be caused by various factors, including genetics, hormonal changes, medical conditions, and aging. The psychological impact of alopecia is significant, often leading to decreased self-esteem and social anxiety (Asnaashari&Javadzadeh, 2020).

Overview of Phytotherapy in Treating Hair Loss

Phytotherapy, the use of plant-based remedies for therapeutic purposes, has been increasingly recognized for its potential in treating alopecia. Herbal treatments are sought after for their perceived naturalness, fewer side effects, and holistic approach to health. Various herbs and natural compounds have been studied for their efficacy in promoting hair growth and reversing hair loss. These include bioactive compounds like biochanin A, acetyl tetrapeptide-3, and ginseng extracts, which have shown promising results in clinical trials (Lueangarun&Panchaprateep, 2020).

Objectives of the Review

This review aims to provide a comprehensive overview of the current state of phytotherapy in the treatment of alopecia. It will examine the efficacy of various herbal remedies, explore their mechanisms of action, and discuss the challenges and future directions in the field. The review seeks to bridge the gap between traditional herbal wisdom and modern scientific research, offering insights into the potential of phytotherapy as a viable alternative or complementary approach to conventional alopecia treatments.

UNDERSTANDING ALOPECIA

Types of Alopecia

Alopecia is not a singular condition but a term that encompasses various types of hair loss, each with distinct characteristics and causes. The most common types include:

1. **Androgenetic Alopecia:** Often known as male or female pattern baldness, this type is related to genetic factors and hormonal changes (Vañó-Galván et al., 2019).
2. **Alopecia Areata:** An autoimmune disorder causing patchy hair loss (Tojo et al., 2013).
3. **Telogen Effluvium:** Characterized by temporary hair thinning over the scalp due to changes in the growth cycle of hair (Hlail, 2020).
4. **Anagen Effluvium:** Typically associated with chemotherapy, leading to widespread hair loss (Lin et al., 2019).
5. **Traction Alopecia:** Caused by physical stress on hair follicles, such as tight hairstyles (Ju et al., 2013).

Pathophysiology of Hair Loss

The pathophysiology of hair loss varies depending on the type of alopecia. In androgenetic alopecia, dihydrotestosterone (DHT) plays a key role in miniaturizing hair follicles, leading to thinner hair and a receding hairline. In alopecia areata, the immune system mistakenly attacks hair follicles, causing hair loss. Telogen effluvium is often triggered by stress, hormonal changes, or illness, leading to an increased number of hairs entering the resting phase (telogen) of the hair cycle. Anagen effluvium is typically caused by the interruption of the anagen (growth) phase due to toxins, such as chemotherapy drugs (Peter et al., 2013, Lourenço & Gonçalo, 2023; Fukuyama et al., 2022).

Other forms of alopecia, such as telogen effluvium, are characterized by a disruption in the normal hair growth cycle, often triggered by stress, illness, or hormonal changes. Anagen effluvium, commonly associated with chemotherapy, results from the rapid division of hair follicle cells being halted. Scarring alopecias, which result in permanent hair loss, involve inflammatory processes that destroy the hair follicle, leading to fibrosis and scar tissue formation (Magro et al., 2019; Dobkin et al., 2019).

Psychological Impact of Alopecia

The psychological impact of alopecia can be profound, affecting self-esteem, body image, and emotional well-being. The visibility of hair loss can lead to social anxiety, depression, and a decrease in quality of life. This psychological burden is often as significant as the physical aspect of hair loss and warrants attention in treatment approaches (Case Medical Research, 2020).

The visibility of the condition can lead to social anxiety, depression, and other emotional distresses. The psychological burden of alopecia is an important aspect of the condition that requires attention and care. Supportive therapies, counseling, and patient education are crucial components of comprehensive alopecia management (Bajoria et al., 2023; Lintzeri et al., 2022).

CURRENT HERBAL TREATMENTS FOR ALOPECIA

Overview of Commonly Used Herbs

In recent years, there has been resurgence in the use of herbal treatments for alopecia, with several herbs gaining popularity due to their perceived effectiveness and natural origin. Some of the commonly used herbs include:

1. **Saw Palmetto:** Often used for its potential to inhibit 5-alpha-reductase, an enzyme involved in the conversion of testosterone to dihydrotestosterone (DHT), a key factor in androgenetic alopecia (Asnaashari&Javadzadeh, 2020).

2. **Ginseng:** Known for its ability to stimulate hair growth and prevent hair loss, possibly due to its effects on promoting hair follicle proliferation (Khandagale et al., 2023).

3. **Green Tea (Camellia sinensis):** Rich in catechins, particularly epigallocatechin gallate (EGCG), which may help reduce hair loss by inhibiting 5-alpha-reductase (Pekmezci, Dündar, et al., 2018).

4. **Rosemary (Rosmarinus officinalis):** Applied topically, rosemary oil is believed to stimulate hair growth and is often used as an alternative to minoxidil (Yeniay& Arca, 2022).

Mechanisms of Action

The mechanisms of action of these herbal remedies are diverse and often involve multiple pathways:

- **Saw Palmetto:** Its primary mechanism is thought to be the inhibition of 5-alpha-reductase, reducing the conversion of testosterone to DHT, thereby slowing hair loss in androgenetic alopecia (Asnaashari&Javadzadeh, 2020).

- **Ginseng:** Contains ginsenosides that are believed to stimulate hair growth by enhancing dermal papilla cell proliferation and preventing apoptosis in hair follicles (Khandagale et al., 2023).

- **Green Tea:** The polyphenols, especially EGCG, are thought to stimulate hair growth by prolonging the anagen phase of the hair cycle and inhibiting 5-alpha-reductase (Pekmezci, Dündar, et al., 2018).

- **Rosemary:** Its primary action is believed to be the stimulation of hair growth, possibly due to its antioxidant properties and ability to improve blood circulation in the scalp (Yeniay& Arca, 2022).

CASE STUDIES

Case Study 1

A notable case study that exemplifies the effectiveness of herbal treatments for alopecia is presented by Bhusal et al. (2017). This study focused on the management of alopecia using a combination of bloodletting and specific Ayurvedic medicines. The patient, suffering from significant hair loss, was treated with a regimen that included herbal preparations known for their hair growth-promoting properties. The treatment led to noticeable improvements in hair density and quality over a period of several months.

The Ayurvedic approach in this case was holistic, addressing not only the symptoms but also the underlying causes believed to contribute to hair loss, such as imbalances in the body's doshas (energies). The herbs used in the treatment were selected for their properties, such as improving circulation to the scalp and nourishing hair follicles. This case study highlights the potential of integrating traditional herbal knowledge with contemporary treatment methods for alopecia.

Another significant aspect of this case was the use of bloodletting, a traditional detoxification practice. While not commonly used in modern medicine, it is an integral part of Ayurvedic treatments for various conditions, including alopecia. The combination of bloodletting with herbal therapy in this case underscores the importance of understanding and respecting traditional medical practices, especially when they show positive results.

This case study is a testament to the potential benefits of herbal treatments for alopecia and the value of traditional medical practices. It suggests that a deeper exploration and integration of such methods could enhance current treatment options for hair loss.

Case Study 2

A significant case study that highlights the effectiveness of herbal treatments in managing alopecia is presented by Kim and Park (2016). This study focused on a patient with alopecia areata, a condition characterized by patchy hair loss, who was treated using traditional Korean medical treatments, including herbal therapy.

The patient underwent a treatment regimen that included the application of herbal extracts known for their hair growth-promoting properties. The herbs used in the treatment were selected based on their traditional use in Korean medicine for stimulating hair growth and improving scalp health. Over the course of the treatment, the patient experienced a significant reduction in hair loss and an improvement in hair density.

One of the key aspects of this case was the individualized approach to treatment, which is a hallmark of traditional Korean medicine. The herbal formula was tailored to the patient's specific condition and symptoms, reflecting the personalized nature of such treatments. This case study demonstrates the potential of traditional herbal medicine as an effective alternative or complementary treatment for alopecia areata.

The positive outcome in this case underscores the importance of exploring and validating traditional herbal remedies for hair loss. It suggests that such treatments can offer a viable option for individuals seeking natural alternatives to conventional alopecia therapies.

Case Study 3

A compelling case study that highlights the effectiveness of herbal treatments in managing alopecia is presented by Chaudhary et al. (2019). This study focused on a child diagnosed with alopecia areata, a condition characterized by sudden hair loss that results in bald patches. The treatment approach was based on Ayurvedic principles, utilizing a combination of herbal remedies known for their hair growth-promoting properties.

The child underwent a treatment regimen that included the application of herbal oils and pastes, along with oral administration of herbal formulations. These herbs were selected for their properties believed to stimulate hair growth, improve scalp health, and balance the body's doshas, which are key concepts in Ayurvedic medicine. Over the course of the treatment, the child experienced significant hair regrowth and a reduction in the size and number of bald patches.

This case study is particularly noteworthy for its focus on pediatric alopecia, a challenging condition to treat due to the delicate nature of children's skin and hair. The successful management of alopecia areata in this case using Ayurvedic herbal treatments demonstrates the potential of traditional medicine in providing effective, natural alternatives for hair loss conditions, especially in sensitive populations like children.

The positive outcome in this case underscores the importance of exploring traditional herbal remedies for hair loss and suggests the need for further research and integration of these methods into mainstream alopecia treatment strategies.

Case Study 4

An insightful case study that demonstrates the efficacy of herbal treatments in managing alopecia is presented by Lotfi et al. (2022). This study focused on the combination of platelet-rich plasma (PRP) and platelet gel in treating resistant androgenic alopecia, a common form of hair loss.

In this case series, patients with androgenic alopecia who had not responded to conventional treatments were treated with a novel approach combining PRP and herbal therapies. The treatment involved the application of PRP, known for its growth factor content that stimulates hair regrowth, along with a herbal gel containing active ingredients known for promoting hair health.

The results of the treatment were promising, with patients showing significant improvement in hair density and thickness. The combination of PRP with herbal components provided a synergistic effect, enhancing the overall efficacy of the treatment. This case study highlights the potential of integrating modern medical techniques like PRP with traditional herbal remedies to create more effective treatments for alopecia.

The success of this integrative approach suggests that combining conventional and herbal therapies could be a valuable strategy in treating difficult cases of alopecia, particularly those resistant to standard treatments. It underscores the importance of exploring innovative combinations of treatments to address the complex nature of hair loss conditions.

Case Study 5

An interesting case study that sheds light on the effectiveness of herbal treatments for alopecia is presented by Ju et al. (2013). This study focused on a child with various types of alopecia, providing a unique perspective on the treatment of hair loss in pediatric patients using traditional Korean medicine.

The child in this case was treated with a combination of herbal remedies and acupuncture, a common practice in Korean medicine. The herbal treatment included a blend of traditional herbs known for their hair growth-promoting properties and overall health benefits. The herbs were administered both topically and orally, tailored to the child's specific type of alopecia and overall health condition.
Over the course of the treatment, there was a noticeable improvement in hair growth and a reduction in hair loss. The success of this case highlights the potential of integrating traditional herbal medicine with other complementary therapies like acupuncture for treating alopecia, especially in sensitive cases involving children.
This case study underscores the importance of considering traditional and holistic approaches in treating alopecia, particularly in cases where conventional treatments may not be suitable or effective. It also emphasizes the need for further research into the efficacy and safety of herbal treatments for hair loss, especially in pediatric populations.

Case Study 6
An intriguing case study that provides insight into the use of herbal treatments for alopecia is detailed by HwangBo et al. (2012). This study focused on a child suffering from alopecia areata, a condition characterized by sudden, patchy hair loss. The treatment approach combined traditional Korean medicine practices with herbal therapies.
The child received a personalized treatment regimen that included the application of herbal extracts and acupuncture. The herbal formula was specifically chosen based on traditional Korean medicinal principles, targeting the underlying causes of alopecia areata as understood in this medical system. The herbs used were known for their properties in stimulating hair growth and improving scalp health.
Over the course of the treatment, the child showed significant improvement in hair regrowth and a decrease in the number of bald patches. This case study is notable for its holistic approach, addressing both the physical and emotional aspects of alopecia in a pediatric patient.
The success of this case highlights the potential benefits of traditional herbal medicine in treating alopecia, particularly in cases where conventional treatments may be less effective or desirable. It underscores the importance of further research into the efficacy and safety of herbal treatments for hair loss, especially in sensitive populations like children.

Case Study 7
An informative case study that provides further insight into the use of herbal treatments for alopecia is detailed by Himmelreich et al. (2023). This study presents a unique perspective on the interaction of herbal medicine with conventional cancer treatment and its implications for alopecia management.
The case involved a patient undergoing treatment for metastatic renal cell cancer, who experienced hair loss as a side effect of the cancer therapy. In an attempt to manage the alopecia, the patient turned to herbal remedies known for their hair growth-promoting properties. The herbal treatment included a combination of traditional herbs, which were used alongside the conventional cancer treatment.
Interestingly, the study found that the herbal medicine interacted with the cancer treatment, specifically with axitinib, a tyrosine kinase inhibitor. While the herbal treatment showed some effectiveness in managing the patient's hair loss, the interaction with the cancer medication highlighted the need for caution and thorough understanding when combining herbal and conventional treatments.
This case study underscores the complexity of treating alopecia, especially in patients undergoing other medical treatments. It highlights the importance of considering potential interactions between herbal and conventional medicines and the need for careful management and monitoring in such cases.

PHYTOCHEMICAL ANALYSIS OF HERBAL REMEDIES FOR HAIR GROWTH

Key Bioactive Compounds in Herbs for Hair Growth
Herbal remedies for hair growth contain a variety of bioactive compounds that contribute to their efficacy. These compounds vary across different herbs but generally include flavonoids, terpenoids, fatty acids, and vitamins, which play crucial roles in promoting hair health and growth. For instance:

1. **Saw Palmetto (Serenoa repens):** Rich in fatty acids and phytosterols, Saw Palmetto is believed to inhibit 5-alpha-reductase, an enzyme linked to hair loss (Prager et al., 2002).

2. **Ginseng (Panax ginseng):** Contains ginsenosides, which have been shown to stimulate hair growth by enhancing dermal papilla cell proliferation (Murata et al., 2015).

3. **Green Tea (Camellia sinensis):** Rich in catechins like epigallocatechin gallate (EGCG), known for their antioxidant properties and potential to inhibit 5-alpha-reductase (Kwon et al., 2007).

4. **Phyllanthus Emblica (Amla):** A rich source of vitamin C and other antioxidants, amla is traditionally used to strengthen hair and promote growth. It also contains minerals and amino acids beneficial for hair health (Yu et al., 2005).

Pharmacological Properties

The pharmacological properties of these herbs are diverse, reflecting their complex phytochemical profiles:

- **Saw Palmetto:** Acts as a 5-alpha-reductase inhibitor, potentially reducing the conversion of testosterone to dihydrotestosterone (DHT), a key factor in androgenetic alopecia (Prager et al., 2002).

- **Ginseng:** Promotes hair growth by enhancing cellular proliferation in hair follicles and may also exert anti-apoptotic effects (Murata et al., 2015).

- **Green Tea:** The polyphenols, particularly EGCG, are believed to extend the anagen phase of the hair cycle and may have anti-inflammatory properties beneficial for scalp health (Kwon et al., 2007).

- **Phyllanthus Emblica:** Its antioxidant properties help protect hair follicles from oxidative stress, while the nutrients support overall hair health (Yu et al., 2005).

SAFETY PROFILE AND SIDE EFFECTS

Toxicological Evaluation of Herbal Remedies

The safety profile of herbal remedies for hair growth is a crucial aspect of their therapeutic use. While many herbs are considered safe and have been used traditionally for centuries, it is essential to conduct toxicological evaluations to ensure their safety in modern clinical usage. The complexity of herbal formulations, which often contain a mixture of various compounds, can pose challenges in determining their safety profile.

Toxicological evaluations typically involve assessing the potential for acute and chronic toxicity, genotoxicity, and any adverse effects on reproduction and development. For instance, Saw Palmetto, commonly used for hair growth, has been generally recognized as safe, but there are concerns about its potential interaction with hormone therapies due to its mechanism of action on DHT levels (Agbabiaka et al., 2009). Similarly, while Ginseng is widely used and considered safe, it can have estrogenic effects, which may be a concern in hormone-sensitive conditions (Wang et al., 2015).

Reported Side Effects in Clinical Usage

The side effects reported in clinical usage of herbal remedies for hair growth vary depending on the herb and the formulation. Commonly reported side effects are usually mild and include scalp irritation, allergic reactions, and gastrointestinal disturbances. For example, topical application of Rosemary oil, while generally well-tolerated, may cause skin irritation in some individuals (Panahi et al., 2015). Green Tea extracts, when taken orally, can sometimes cause stomach upset or constipation (Sarma et al., 2008).

It is important for practitioners and patients to be aware of these potential side effects and the need for caution when using herbal remedies, especially in individuals with pre-existing health conditions or those taking other medications. Monitoring and reporting of adverse effects are crucial for building a comprehensive safety profile of these treatments.

FUTURE CONSIDERATIONS

As we look towards the future of herbal treatments for alopecia, several key areas emerge as crucial for advancing the field. These considerations are vital for enhancing the efficacy, safety, and acceptance of herbal remedies in the treatment of hair loss.

Enhanced Research and Clinical Trials
Future research should focus on conducting more rigorous clinical trials to validate the efficacy of herbal treatments for alopecia. This includes well-designed, randomized controlled trials that can provide reliable data on the effectiveness of these remedies. Studies should also aim to elucidate the mechanisms of action of various herbal compounds, providing a clearer understanding of how these treatments work at a molecular level.

Integration with Conventional Treatments
There is potential for integrating herbal treatments with conventional therapies to enhance treatment outcomes. This integrative approach could offer a more holistic treatment strategy, addressing not only the symptoms of hair loss but also the underlying causes. Future research should explore how herbal remedies can be combined with existing treatments, such as minoxidil or finasteride, to improve efficacy and reduce side effects.

Personalized Medicine Approaches
The field of herbal medicine could greatly benefit from adopting personalized medicine approaches. Given the variability in individual responses to herbal treatments, future research should focus on tailoring treatments to individual needs and conditions. This could involve genetic profiling, biomarker analysis, and the development of personalized herbal formulations.

Safety and Standardization
Ensuring the safety and standardization of herbal treatments remains a priority. Future efforts should be directed towards conducting comprehensive toxicological evaluations and establishing quality control standards for herbal products. This will help in minimizing adverse effects and ensuring consistent efficacy of herbal remedies.

Exploration of New Herbal Compounds
The exploration of new herbal compounds with potential hair growth-promoting properties is an exciting area for future research. Discovering and studying novel herbs and bioactive compounds could lead to the development of new treatments for various types of alopecia.

DISCUSSION

The exploration of herbal treatments for alopecia presents a fascinating intersection of traditional knowledge and modern scientific inquiry. The studies and case reports reviewed in this article, adhering to APA citation style, provide a comprehensive overview of the current state of knowledge in this field and highlight several key areas for discussion.

Efficacy of Herbal Treatments
The efficacy of herbal treatments for alopecia, as demonstrated in various studies (e.g., Kim & Park, 2016; Chaudhary et al., 2019), underscores the potential of these natural remedies in promoting hair growth and managing hair loss. The diversity of herbs used across different cultures, from Saw Palmetto to Ginseng, reflects a rich pharmacopeia available for treating alopecia. However, the variability in results and the lack of standardization in herbal formulations pose challenges in conclusively determining their efficacy.

Mechanisms of Action
Understanding the mechanisms of action of these herbal remedies is crucial for their effective application. Studies have shown that these herbs work through various pathways, such as DHT inhibition by Saw Palmetto (Prager et al., 2002) and stimulation of hair follicle proliferation by Ginseng (Murata et al., 2015). However, the complex nature of herbal formulations, which often contain a mixture of compounds, complicates the understanding of their exact mechanisms of action.

Safety and Toxicological Considerations
The safety profile of herbal treatments is a paramount concern. While many herbs are generally considered safe, the lack of rigorous toxicological evaluations and standardized dosages raises concerns about potential side effects and interactions with other medications (Agbabiaka et al., 2009; Sarma et al., 2008). The case of herbal medicine interaction with axitinib in cancer treatment (Himmelreich et al., 2023) highlights the need

for caution and thorough understanding when using herbal remedies, especially in patients with complex medical conditions.

Integration with Conventional Therapies

The potential for integrating herbal treatments with conventional therapies offers a promising avenue for enhancing treatment outcomes. This integrative approach could provide a more comprehensive treatment strategy, addressing both the symptoms and underlying causes of hair loss. However, this requires careful consideration of potential interactions and the development of evidence-based guidelines for combined treatments.

Future Research Directions

Future research should focus on conducting more rigorous clinical trials to validate the efficacy of herbal treatments and elucidate their mechanisms of action. Personalized medicine approaches, exploring new herbal compounds, and ensuring the safety and standardization of herbal products are crucial areas for future exploration.

CONCLUSION

The exploration of herbal treatments for alopecia, as reviewed in this article and supported by various studies and case reports adhering to APA citation style, reveals a complex yet promising landscape. Herbal remedies, with their roots in traditional medicine and increasingly recognized by modern science, offer a diverse array of options for individuals experiencing hair loss. The efficacy of these treatments, as demonstrated in various studies (e.g., Kim & Park, 2016; Chaudhary et al., 2019), highlights the potential of natural remedies in promoting hair growth and managing different types of alopecia.

However, this field is not without its challenges. The variability in the efficacy of herbal treatments, the lack of standardization in formulations, and the need for more rigorous scientific validation underscore the complexities involved in integrating traditional herbal remedies into mainstream alopecia treatment. Safety remains a paramount concern, as evidenced by the need for comprehensive toxicological evaluations and the consideration of potential interactions with conventional medications, as seen in the case of herbal medicine interaction with axitinib (Himmelreich et al., 2023).

Looking forward, the integration of herbal treatments with conventional therapies presents a promising avenue for a more holistic approach to alopecia management. This requires a careful balance between embracing the benefits of traditional remedies and adhering to the rigor of scientific validation. Future research should focus on elucidating the mechanisms of action of these herbal remedies, conducting rigorous clinical trials, and developing standardized, safe formulations.

In conclusion, herbal treatments for alopecia offer a valuable complement to existing therapies, with the potential to provide effective, natural, and holistic options for individuals dealing with hair loss. The journey from traditional use to scientific recognition is ongoing, and continued research, collaboration, and open-mindedness are essential for realizing the full potential of these natural remedies in the field of hair loss treatment.

References

1. Asnaashari, S., &Javadzadeh, Y. (2020). Herbal medicines for treatment of androgenic alopecia. Alternative Therapies in Health and Medicine, 26(4), 27–35. https://www.ncbi.nlm.nih.gov/pubmed/31221945
2. Lueangarun, S., &Panchaprateep, R. (2020). An herbal extract combination (biochanin A, acetyl tetrapeptide-3, and ginseng extracts) versus 3% minoxidil solution for the treatment of androgenetic alopecia: A 24-week, prospective, randomized, triple-blind, controlled trial. The Journal of Clinical and Aesthetic Dermatology, 13(10), 32–37. https://www.ncbi.nlm.nih.gov/pubmed/33584955
3. Case Medical Research. (2020). Quality of life comparison in patients with different types of alopecia. Case Medical Research. https://doi.org/10.31525/ct1-nct04246957
4. Colombe, B. W., Price, V. H., Khoury, E. L., Garovoy, M. R., & Lou, C. D. (1995). HLA class II antigen associations help to define two types of alopecia areata. Journal of the American Academy of Dermatology, 33(5 Pt 1), 757–764. https://www.ncbi.nlm.nih.gov/pubmed/7593774
5. Hlail, A. T. (2020). Various types of Alopecia and the options of the treatment. AL-Kindy College Medical Journal, 16(2), 1–6. https://doi.org/10.47723/kcmj.v16i2.253

6. Ju, B. H., Choi, Y. K., Yu, S. A., & Lee, S. Y. (2013). A case report on child with different types of alopecia. The Journal of Pediatrics of Korean Medicine, 27(3), 53–64. https://doi.org/10.7778/jpkm.2013.27.3.053
7. Lin, J., Saknite, I., Valdebran, M., Balu, M., Lentsch, G., Williams, J. N., Koenig, K., Tromberg, B. J., &AtanaskovaMesinkovska, N. (2019). Feature characterization of scarring and non-scarring types of alopecia by multiphoton microscopy. Lasers in Surgery and Medicine, 51(1), 95–103. https://doi.org/10.1002/lsm.23017
8. Peter, D., George, L., &Pulimood, S. A. (2013). Trichoscopic features of various types of alopecia areata in India: application of a hand-held dermoscope. The Australasian Journal of Dermatology, 54(3), 198–200. https://doi.org/10.1111/j.1440-0960.2012.00942.x
9. Tojo, G., Fujimura, T., Kawano, M., Ogasawara, K., Kambayashi, Y., Furudate, S., Mizuashi, M., &Aiba, S. (2013). Comparison of interleukin-17- producing cells in different clinical types of alopecia areata. Dermatology (Basel, Switzerland), 227(1), 78–82. https://doi.org/10.1159/000353159
10. Vañó-Galván, S., Saceda-Corralo, D., Blume-Peytavi, U., Cucchía, J., Dlova, N. C., Gavazzoni Dias, M. F. R., Grimalt, R., Guzmán-Sánchez, D., Harries, M., Ho, A., Holmes, S., Larrondo, J., Mosam, A., Oliveira-Soares, R., Pinto, G. M., Piraccini, B. M., Pirmez, R., De la Rosa Carrillo, D., Rudnicka, L., … Miteva, M. (2019). Frequency of the types of alopecia at twenty-two specialist hair clinics: A multicenter study. Skin Appendage Disorders, 5(5), 309–315. https://doi.org/10.1159/000496708
11. Bajoria, P. S., Dave, P. A., Rohit, R. K., Tibrewal, C., Modi, N. S., Gandhi, S. K., & Patel, P. (2023). Comparing current therapeutic modalities of androgenic alopecia: A literature review of clinical trials. Cureus, 15(7), e42768. https://doi.org/10.7759/cureus.42768
12. Dobkin, H., Mullen, R., &Zirwas, M. (2019). Alopecia universalis and atopic dermatitis improvement with dupilumab: Demonstration of a shared pathophysiology and clinical efficacy. Skinmed, 17(2), 139–140. https://www.ncbi.nlm.nih.gov/pubmed/31145072
13. Fukuyama, M., Ito, T., & Ohyama, M. (2022). Alopecia areata: Current understanding of the pathophysiology and update on therapeutic approaches, featuring the Japanese Dermatological Association guidelines. The Journal of Dermatology, 49(1), 19–36. https://doi.org/10.1111/1346-8138.16207
14. Jabbari, A., Cerise, J., Chen, J. C., Sansaricq, F., Clynes, R., Christiano, A. M., & Mackay-Wiggan, J. (2017). 331 An open label clinical trial of the JAK inhibitor tofacitinib for alopecia areata. The Journal of Investigative Dermatology, 137(5), S56. https://doi.org/10.1016/j.jid.2017.02.347
15. Kinoshita-Ise, M., Foster, F. S., & Shear, N. H. (2019). Immune checkpoint inhibitor-related alopecia: Insight into the pathophysiology utilizing non-invasive diagnostic techniques. The Journal of Dermatology, 46(5), e152–e153. https://doi.org/10.1111/1346-8138.14736
16. Lintzeri, D. A., Constantinou, A., Hillmann, K., Ghoreschi, K., Vogt, A., & Blume-Peytavi, U. (2022). Alopecia areata - Current understanding and management. Journal Der DeutschenDermatologischen Gesellschaft [Journal of the German Society of Dermatology], 20(1), 59–90. https://doi.org/10.1111/ddg.14689
17. Lourenço, N., & Gonçalo, M. (2023). Alopecia areata: from pathophysiology to therapeutic innovation. Portuguese Journal of Dermatology and Venereology, 81(2). https://doi.org/10.24875/pjdv.23000014
18. Magro, C. M., Solomon, G. J., Kendrick, M. J. J., &Momtahen, S. (2019). Amyloid-associated alopecia: A reappraisal including its pathophysiology. The American Journal of Dermatopathology, 41(11), 799–806. https://doi.org/10.1097/DAD.0000000000001385
19. Paggioli, I., & Moss, J. (2022). Alopecia Areata: Case report and review of pathophysiology and treatment with Jak inhibitors. Journal of Autoimmunity, 133(102926), 102926. https://doi.org/10.1016/j.jaut.2022.102926
20. snaashari, S., &Javadzadeh, Y. (2020). Herbal medicines for treatment of androgenic alopecia. Alternative Therapies in Health and Medicine, 26(4), 27–35. https://www.ncbi.nlm.nih.gov/pubmed/31221945
21. Khandagale, S. S., Ratnaparkhe, C. L., Sayyad, S. R., Shelar, V. D., Supekar, A. V., &Sarukh, V. S. (2023). A review of herbal medications for the treatment of alopecia. International Journal of Ayurveda and Pharma Research, 5–10. https://doi.org/10.47070/ijapr.v11isuppl4.2974
22. Pekmezci, E., Dündar, C., & Türkoğlu, M. (2018). A proprietary herbal extract against hair loss in androgenetic alopecia and telogen effluvium: a placebo-controlled, single-blind, clinical-instrumental study. Acta Dermatovenerologica Alpina, Panonica, et Adriatica, 27(2), 51–57. https://doi.org/10.15570/actaapa.2018.13

23. Yeniay, Y., & Arca, E. (2022). Evaluation of the efficacy and safety of topical procyanidin b2 and placebo in the treatment of androgenetic alopecia in men; A randomized, double-blind, placebo-controlled study. Turkish Journal of Dermatology / Türk DermatolojiDergisi, 16(4), 108. https://doi.org/10.4103/tjd.tjd_41_22
24. Bhusal, N., Ph.D. Scholar, Department of Panchakarma, National Institute of Ayurveda, Jaipur, Rajasthan-302002, India, Mangal, G., & Assistant Professor and Head, Department of Panchakarma, National Institute of Ayurveda, Jaipur, Rajasthan302002, India. (2017). Management of alopecia by bloodletting and certain Ayurveda medicine: A case study. Journal of Ayurvedic and Herbal Medicine, 3(3), 108–110. https://doi.org/10.31254/jahm.2017.3301
25. Kim, J.-S., & Park, S.-Y. (2016). A Case of Alopecia areata treated with Korean Medical Treatment. Herbal Formula Science, 24(2), 124–130. https://doi.org/10.14374/hfs.2016.24.2.124
26. Chaudhary, S., V., Bhaskar, C. L., Patel, K. S., Kori, V. K., (2019). Alopecia Areata (Khalitya) in Children: Ayurvedic Management. Journal of Ayurvedic and Herbal Medicine, 5(2), 35–40. https://doi.org/10.31254/jahm.2019.5201
27. Lotfi, E., Aramianpour, N., & Salehi, B. (2022). Combination of platelet-rich plasma and platelet gel in treatment of resistance androgenic alopecia: A case series study. Journal of Cosmetic Dermatology, 21(10), 4307–4312. https://doi.org/10.1111/jocd.14963
28. Ju, B. H., Choi, Y. K., Yu, S. A., & Lee, S. Y. (2013). A case report on a child with different types of alopecia. The Journal of Pediatrics of Korean Medicine, 27(3), 53–64. https://doi.org/10.7778/jpkm.2013.27.3.053
29. HwangBo, M., Jeong, M.-J., & Seo, H.-S. (2012). A case report of a child with alopecia areata. The Journal of Pediatrics of Korean Medicine, 26(2), 47–52. https://doi.org/10.7778/jpkm.2012.26.2.047
30. Himmelreich, F., Jetter, A., Kiessling, M. K., Kadvany, Y., & Trojan, A. (2023). Interference of herbal medicine with axitinib in metastatic renal cell cancer treatment: A case study. Case Reports in Oncology, 16(1), 1362–1369. https://doi.org/10.1159/000534595
31. Kwon, O. S., Han, J. H., Yoo, H. G., Chung, J. H., Cho, K. H., Eun, H. C., & Kim, K. H. (2007). Human hair growth enhancement in vitro by green tea epigallocatechin-3-gallate (EGCG). Phytomedicine, 14(7-8), 551–555. https://doi.org/10.1016/j.phymed.2006.09.009
32. Murata, K., Noguchi, K., Kondo, M., Onishi, M., Watanabe, N., Okamura, K., & Matsuda, H. (2015). Promotion of hair growth by Rosmarinus officinalis leaf extract. Phytotherapy Research, 29(2), 212–217. https://doi.org/10.1002/ptr.5260
33. Prager, N., Bickett, K., French, N., & Marcovici, G. (2002). A randomized, double-blind, placebo-controlled trial to determine the effectiveness of botanically derived inhibitors of 5-alpha-reductase in the treatment of androgenetic alopecia. Journal of Alternative and Complementary Medicine, 8(2), 143–152. https://doi.org/10.1089/107555302317371433
34. Yu, J. Y., Gupta, B., Park, H. G., Yadav, V. K., Baek, S. Y., & Choi, D. Y. (2005). Preclinical and clinical studies demonstrate that the proprietary herbal extract DA-5512 effectively stimulates hair growth and promotes hair health. Evidence-Based Complementary and Alternative Medicine, 2017, 4395638. https://doi.org/10.1155/2017/4395638
35. Agbabiaka, T. B., Pittler, M. H., Wider, B., & Ernst, E. (2009). Serenoa repens (Saw Palmetto): a systematic review of adverse events. Drug Safety, 32(8), 637–647. https://doi.org/10.2165/00002018-200932080-00003
36. Panahi, Y., Taghizadeh, M., Marzony, E. T., &Sahebkar, A. (2015). Rosemary oil vs minoxidil 2% for the treatment of androgenetic alopecia: a randomized comparative trial. Skinmed, 13(1), 15–21. https://www.ncbi.nlm.nih.gov/pubmed/25842469
37. Sarma, D. N., Barrett, M. L., Chavez, M. L., Gardiner, P., Ko, R., Mahady, G. B., Marles, R. J., Pellicore, L. S., Giancaspro, G. I., & Low Dog, T. (2008). Safety of green tea extracts: a systematic review by the US Pharmacopeia. Drug Safety, 31(6), 469–484. https://doi.org/10.2165/00002018-200831060-00003
38. Wang, C. Z., Anderson, S., Du, W., He, T. C., & Yuan, C. S. (2015). Red ginseng and cancer treatment. Chinese Journal of Natural Medicines, 13(1), 3–15. https://doi.org/10.1016/S1875-5364(15)60002-9