

Androgenetic Alopecia (AGA)

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Androgenetic Alopecia (AGA): Pharmacologic and Alternative Treatments for Hair Loss

Conflict of Interest and Disclosures

We have no conflicts and nothing to disclose



Androgenetic Alopecia (AGA)

- ⌘ Most common form of non-scarring alopecia
 - ⌘ Affects roughly 50 million men and 30 million women in the United States.¹⁻³
- ⌘ Result of the gradual miniaturization of individual hair follicles due to a complex interaction between genetic susceptibility and hormone interactions.^{4,5}

Pathophysiology of AGA

- ⌘ Each hair follicle transitions through three key phases: anagen (growth), catagen (involution), and telogen (rest) stages.^{2-4,7,8}
- ⌘ AGA shortens anagen, causing miniaturization of hair follicles, and replacement of terminal hairs with barely visible vellus hairs.^{2,4,5}
- ⌘ The actions of dihydrotestosterone (DHT) are well characterized in male pattern hair loss but are less certain in female pattern hair loss.⁶
 - ⌘ The Type II isoform of 5-alpha reductase (5-AR) metabolizes testosterone to DHT.²⁻⁵
 - ⌘ Elevated androgen metabolism at the level of the hair follicle leads to receptor binding and activation of genes resulting in miniaturization of hair follicles.^{2,4,5}

Current Therapeutic Options

- ⌘ Each year, consumers spend millions of dollars on hair restoration products, but therapeutic options are limited.³
- ⌘ There are only two United States Food and Drug Administration (FDA) approved therapies for the treatment of AGA.²
 - ⌘ Oral finasteride: prescription only inhibitor of 5-AR.^{2-4,8}
 - ⌘ Topical minoxidil: over-the-counter potassium channel opener and vasodilator
- ⌘ Additional treatment modalities available to patients but rigorous scientific evidence is lacking.³

The Problem

- ⌘ Alopecia may lead to distress, anxiety, and/or depression.^{4,9}
 - ⌘ Cosmetic market saturated with alternative treatments claiming hair regrowth properties.

Our Study

🔗 Title: The diverse landscape of alternative hair growth ingredients for patients with androgenetic alopecia

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🔗 Currently under peer review for publication in Dermatology Online Journal

Study Objective

🔗 **In this consumer market search, our aim was to identify and analyze the efficacy of the top five common hair regrowth agents available to consumers in shampoo formulations.**

Methods

🔗 Used Amazon.com to search for hair regrowth shampoos

🔗 50 shampoos reviewed in total

⌘ Ingredient names inserted into a Structured Query Language (SQL) database table

⌘ Allows for easy aggregations and counts on unique ingredient names

🔗 Ingredients found in 2+ shampoo formulations were categorized using a simple internet search, the PubChem Compound Database, the Environmental Working Group's (EWG's) Skin Deep® Cosmetics Database, and/or Cosmeticsinfo.org

⌘ Ingredients classified under hair growth were considered active.

Results¹⁰

- ⌘ Total of 473 unique ingredients were identified among the selected top 50 shampoos
 - ⌘ 62 ingredients classified as having hair growth properties
- ⌘ Top 5 hair growth agents:
 - ⌘ coconut oil
 - ⌘ vitamin B7 (biotin)
 - ⌘ aloe vera (*Aloe barbadensis*)
 - ⌘ saw palmetto extract (*Serenoa repens*)
 - ⌘ rosemary oil (*Rosmarinus officinalis*)

Top 5 Hair Growth Ingredients¹⁰

Ingredient Name	Shampoos Containing Ingredient (N = 50)	Ingredient Prevalence in Shampoos (%)
Coconut Oil	45	90%
Vitamin B7 (Biotin)	30	60%
Aloe Vera	24	48%
Saw Palmetto Extract	20	40%
Rosemary Oil	18	36%

Coconut Oil

- ⌘ Anecdotal evidence suggests continued topical application of coconut oil to hair leads to healthy looking, long hair.¹⁴
- ⌘ The purported mechanism appears to be coconut oil's lubricating effect on friction which reduces damage during combing.^{14,15}
- ⌘ Radiolabeling coconut oil with tritium allowed researchers to quantify oil penetration into hair.¹⁵ Although coconut oil did infiltrate hair, the majority of the oil was found localized on the surface.¹⁵
- ⌘ Coconut oil may improve overall hair health and prevent damage but no evidence is available that shows categorical improvements in hair growth.

Vitamin B7 (Biotin)

- ⊗ Cofactor for carboxylase enzymes
 - ⊗ gluconeogenesis, lipogenesis, fatty acid synthesis, and protein catabolism.^{13,16,17}
- ⊗ Biotin deficiency linked to alopecia^{13,16}
 - ⊗ Deficiency = <100ng/L
 - ⊗ Rare in well-developed countries
 - ⊗ Secondary causes:
 - ⊗ medication use (antiepileptics, isotretinoin, antibiotics) or gastrointestinal disease.^{13,16}
- ⊗ Case reports have demonstrated oral biotin's effectiveness in hair and nail growth disorders but only in patients with established biotin deficiency.¹⁷
- ⊗ No data exists on topically administered biotin for hair regrowth.¹⁷

Aloe Vera (*Aloe barbadensis*)

- ⊗ Consumers might be most familiar with aloe use in skin disorders ranging from eczema and psoriasis, to acne and burn healing.^{18,19}
- ⊗ Contains more than 75 active ingredients^{18,20} complicating researchers ability to link product to therapeutic effect.
 - ⊗ Has shown anti-inflammatory activity in animal studies and antimicrobial activity *in vitro*.^{18,20}
- ⊗ These effects are frequently linked to unsubstantiated claims of improved hair growth. Without explicit study, consumers should be wary of online articles suggesting improvements in hair growth.

Saw Palmetto Extract (*Serenoa repens*)

- ⊗ Multiple Mechanisms of Action:
 - ⊗ Inhibits 5-Alpha reductase
 - ⊗ Blocks 50% of DHT binding to androgen receptors
 - ⊗ Increases conversion of DHT to the weaker androgen, androstenediol (enhances activity of 3 α -hydroxysteroid dehydrogenase).^{4,12,20}
- ⊗ Rossi et al (2012)²¹
 - ⊗ Oral saw palmetto + Beta-sitosterol vs. placebo
- ⊗ Prager et al (2002)²²
 - ⊗ Comparison of finasteride 1mg/day vs. oral saw palmetto 320mg/day taken daily x2 years
- ⊗ Wessagowitt et al. (2016)²³
 - ⊗ Topical saw palmetto extract 3.3 mL serum x4 weeks, 2mL lotion x24 weeks

Rosemary Oil (*Rosmarinus officinalis*)

- ⌘ In a mouse model, rosemary oil improved hair growth, inhibited 5-AR, and prevented DHT binding to androgen receptors.²⁶
- ⌘ In 100 male patients, aged 18-49 years with AGA, topically administered rosemary oil was compared to minoxidil 2%.²⁴
 - ⌘ Both products were applied twice daily and each group experienced significant improvements in hair count at 6 months.²⁴

Conclusion

- ⌘ Saw palmetto and rosemary oil have reasonable evidence for their topical use in a normally healthy individual
- ⌘ Study Limitations:
 - ⌘ Our study reviewed agents promoting hair growth found within shampoos and did not include a review of oils, creams, foams, or oral therapies.
 - ⌘ Amazon products are only a snapshot in the vast landscape of products
- ⌘ Primary care physicians are on the first point of contact for patients struggling with AGA
 - ⌘ Need to be aware of some the ingredients found in OTC products to better inform and help patients

Questions?

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