Vehicles and Formulas:

Alopecia Review

Sarah Taylor, PharmD
Updated July 2026

Alopecia affects a significant number of Americans. One study of men between the ages of 18 to 49, found that 42% of the men had moderate to extensive hair loss.' Hair loss is less prevalent in women and has a reported incidence of between 29 to 38% in women over 70 years of age.[2] There are a variety of different pathologies that can contribute to hair loss including noncicatricial alopecias such as androgenic alopecia, alopecia areata, and telogen effluvium as well as cicatricial alopecias such as lichen planopilaris.

Androgenetic alopecia is the most prevalent form of hair loss in both men and women.[3] In this review, we will focus on noncicatricial alopecias and review topical treatments and their evidence for efficacy for various types of hair loss.

The most common type of hair loss, androgenetic alopecia, has been well studied. It can be precipitated by acute stressors, weight loss, drugs (including contraceptives that contain androgenic progestins), and of course, has a strong genetic component.[4] Androgenetic alopecia is caused by increased sensitivity to androgens and can be precipitated by factors such as increased dihydrotestosterone (DHT) resulting in hair follicle miniaturization and the shortening of the hair growth (anagen) phase.[5] This type of alopecia grows more common with advancing age. Conversely, alopecia areata often onsets before the age of 30, and hair loss is caused by autoimmune destruction of hair follicles. Alopecia areata often looks distinct from androgenetic alopecia, rather than causing thinning and hairline recession, alopecia areata tends to cause round areas of total hair loss and oddly shaped hairs called exclamation point hairs. Other types of noncicatricial alopecia include telogen and anagen effluvium. Telogen effluvium is diffuse hair loss and can usually be attributed to a stressor event, generally occurring several months before the hair loss is seen. This hair loss is the result of 20-50% of scalp hair transitioning to the telogen phase prematurely. Anagen effluvium is also characterized by diffuse hair loss but is associated with hair breakage during the anagen phase. This type of alopecia generally occurs within 1 to 4 weeks of a precipitating event such as radiation therapy or chemotherapy.[6]

Topical minoxidil has been well studied in both male and female patients at both 2% and 5%. Studies have demonstrated the superior efficacy of 5% minoxidil over 2% minoxidil twice daily. One study reported 45% more hair growth at week 48 of the study in the 5% minoxidil group. However, this increase in efficacy was tempered with increased adverse effects including pruritus and local irritation.[4,7] Though data suggests that 5% topical minoxidil is superior to 2%, little data exists on concentrations above 5% and what data does exist is mixed. One double-blind, placebo-controlled randomized trial of 90 male patients with androgenetic alopecia evaluated 5% minoxidil as compared to 10% topical minoxidil for hair growth. Patients applied either 5% topical minoxidil, 10% topical minoxidil or placebo over a 36-week period. The study found increased hair count in the 5% minoxidil group compared to 10% minoxidil or placebo and increased irritation in the minoxidil 10% group as compared to the other groups.[8] Data is limited on concentrations higher than 10%. One study of minoxidil 15% vs 5% applied twice daily in patients with androgenetic alopecia did find statistically significant

improvement in the 15% group as compared to the 5% group.[9,10] Another study in female patients with female pattern hair loss who reported failing to respond to minoxidil 5% did note benefit when these patients were subsequently treated with minoxidil 15% solution. The study noted an increase in more than 13.7% hair count from base line after 12 weeks of treatment, though, it should be noted that this study was not a direct comparison of the two treatments.[11] These researchers theorized based on their previous research that those who do not respond to topical minoxidil at 5% concentrations may have a decreased ability to convert minoxidil to its active minoxidil sulfate form given a lack of sulfotransferase enzyme activity. For these specific patients who have decreased capability of minoxidil conversion to the active form, high concentrations of minoxidil could potentially offer greater benefit than lower concentrations.[11,12]

Finasteride, a 5-alpha reductase inhibitor, is another commonly used agent for androgenic alopecia. Though the use of oral finasteride for alopecia is well documented, limited information exists on topical finasteride. Finasteride at concentrations of 0.005% have been tested in men and women and a statistically significant benefit was observed after 6 months of use.[16] Another 6-month long study in men tested a 1% finasteride gel formulation vs finasteride oral tablets and found efficacy with the topical gel.[14] A more recent study of androgenic alopecia in male patients tested 0.25% finasteride in combination with 3% minoxidil vs 3% minoxidil alone over the course of 24 weeks and concluded that the combination therapy was significantly superior to minoxidil alone.[15,16] Another study of combination minoxidil 5% and finasteride 0.25% once daily topical spray corroborated this result, finding combination treatment to be more efficacious than minoxidil twice daily or finasteride once daily treatment alone.[17] Though finasteride has been studied in both male and female patients and noted to be efficacious, a cautious approach should be taken in female patients of childbearing age. Topical finasteride is an attractive alternative to oral finasteride due to fewer adverse events resulting from lower systemic absorption, however, studies show measurable finasteride serum levels with topical application as well. One study comparing 0.25% topical finasteride solution twice daily to 1mg tablets once daily in male patients found plasma DHT levels significantly suppressed in both treatment groups.[18] While systemic absorption of finasteride from the topical route is reduced as compared to the oral route, evidence suggests that absorption does occur so caution must be taken in patients of childbearing age.

Dutasteride is another 5-alpha reductase inhibitor distinct from finasteride in that it inhibits both type I and type II 5-alpha reductase. This difference in mechanism has been hypothesized to be responsible for increased efficacy in treating alopecia in studies comparing oral dutasteride to oral finasteride.[19] The efficacy of oral dutasteride has been well established in the literature for management of alopecia, and new evidence suggests topical dutasteride is beneficial as well. While finasteride has been studied for once daily or twice daily use in the literature, some studies suggest that dutasteride could be applied less frequently due to its long half-life, with one study hypothesizing that though their studied product was applied once daily, even just 2-3 applications of topical dutasteride per week could be sufficient.[21,22] Despite the potential for less frequent dosing, currently data is only available on the efficacy of daily use. One randomized double-blind controlled study compared topical dutasteride at 0.01%, 0.02%, and 0.05% to placebo or finasteride 1mg orally daily over a 24 week period. Patients in the topical treatment groups applied 1mL of solution daily via dropper bottle. The patients in the dutasteride 0.05% group demonstrated the most significant improvements in total area hair count and width over the 24 week period. An evaluation of safety of the product did not note major changes in testosterone or DHT in the dutasteride topical treatment group.[82]

Tretinoin, a retinoid, has also been evaluated for efficacy for management of alopecia. One study of once-daily tretinoin 0.01% with minoxidil 5% vs twice-daily minoxidil 5% found that the once-daily combination therapy was as effective as the twice-daily minoxidil treatment.[23,27] Previously it was hypothesized that the benefit of

combination treatment with minoxidil and tretinoin may be due to increased penetration of minoxidil, but a recent study proposed that tretinoin has an impact on the enzyme that converts minoxidil to its active form, follicular sulfotransferase, and may increase response to minoxidil via increased expression of this enzyme.[28] Information on the use of other retinoids, including adapalene and tazarotene, for alopecia is limited. One study evaluating mometasone furoate 0.1% vs mometasone furoate 0.1% in conjunction with adapalene 0.1% for alopecia areata found statistically significant more hair growth with the combination product than with mometasone alone over the 12-week study.[29]

Spironolactone, a competitive inhibitor of androgen receptors, is another agent sometimes used topically for hair loss. One study of 60 female patients found a spironolactone 1% topical to be effective at promoting hair growth.[30] Another evaluating 1% spironolactone solution in male and female patients noted the treatment to be safe and effective at increasing total hair count when applied once daily over 6 months.[31] Another study evaluated spironolactone 5% alone compared to 5% spironolactone in combination with 5% minoxidil and 5% minoxidil alone. All treatments were applied twice daily over 12 weeks. The study noted increased hair growth at the 12 week timepoint, and concluded that the combination treatment offered greater improvement than single agent treatment.[31, 32]

Given the major role that hormones have been shown to play in the cycle of hair growth and loss, hormones have also been evaluated in limited studies for potential benefit for alopecia. One 6-month long study evaluating estradiol 0.025% (alpha estradiol, rather than bioidentical beta estradiol) topical lotion in patients with androgenetic alopecia found a decrease in hair loss, however, regrowth of new hairs was not demonstrated. A possible mechanism is an estrogen- induced increase in glycoprotein sex hormone-binding globulin leading to decreased free testosterone.[34] Bioidentical topical progesterone can inhibit conversion of testosterone to DHT and has also been studied in a limited capacity for treatment of alopecia. One small study of female patients compared progesterone 2% (2mL applied daily) to minoxidil 2% and found that while benefit was greater in the minoxidil group, significant hair regrowth was noted in the progesterone group as well.[35]

Azelaic acid, a common ingredient in dermatological preparations for the management of conditions such as acne or rosacea, has also been recently evaluated for benefit in treating alopecia. The mechanism of action has not been fully elucidated, but benefit may be due to azelaic acid's anti-inflammatory and antioxidant effects as well as azelaic acid's ability to inhibit 5-alpha reductase. One study of azelaic acid 5% compared to minoxidil 2% in female patients noted similar benefit in both treatment groups.[36] Other studies have looked at combination treatment. A study of caffeine 1%, minoxidil 5%, azelaic acid 1.5% in male patients showed benefit over minoxidil alone and placebo treatment groups.[37]

While minoxidil and treatments influencing hormones play a large role in alopecia management, other mechanisms of action for increasing hair growth and preventing hair loss have also been evaluated and found effective. Latanoprost and bimatoprost are both prostaglandin analogues generally used for glaucoma, however, recent evidence has emerged suggesting that in addition to their effect on increased eyelash growth, they may also be able to promote increased hair growth via prostaglandin mediated anagen induction. Latanoprost has been studied at a very wide range of concentrations. One double-blind placebo-controlled study on topical application of 0.005% latanoprost over a period of 12 weeks found that the application of latanoprost significantly increased hair density and regrowth, though, it didn't demonstrate significant improvement regarding loss of hair.[38] Another double-blind placebo-controlled trial evaluated the efficacy of latanoprost 0.1% for androgenetic alopecia applied daily over 24 weeks. The study found significantly increased hair density at 24 weeks compared to placebo.[39] Unlike the wide range of studied concentrations with latanoprost, bimatoprost has primarily been studied at 0.03%. One study evaluating bimatoprost 0.03%

twice daily vs mometasone furoate once daily for alopecia areata found that bimatoprost significantly improved hair regrowth as compared to areas where mometasone furoate was applied.[40] Another study evaluated bimatoprost 0.03% vs minoxidil 5% for androgenetic alopecia. This study was small (with just 8 subjects per group) but it did note significant increase in terminal hair diameter and count at 12 weeks in the bimatoprost group. Fewer patients presented with erythema in the bimatoprost group as compared to the minoxidil group as well.[41]

Though the mechanism of action has yet to be fully elucidated, topical melatonin has also been associated with an increase in anagen hair in female patients with both diffuse and androgenetic alopecia. Melatonin 0.1% solution was applied to the scalps of female patients for 6 months resulting in increased hair growth as compared to the placebo group.[42] Even lower concentrations have demonstrated benefit as well, with a study of melatonin 0.0033% in male and female patients noting an increase in hair density and hair count.[77]

Caffeine is also under investigation as a possible ingredient for treatment of alopecia. It is hypothesized that caffeine may play a role in alopecia via increasing intracellular cyclic adenosine monophosphate (cAMP) resulting in increased cell metabolism and proliferation. Concentrations of caffeine in alopecia studies vary significantly. One randomized, double-blind controlled trial in male and female patients of caffeine 2.5% combined with minoxidil 2.5% vs minoxidil alone found the combination to be more effective.[37] Another open-label non-inferiority trial testing caffeine 0.2% topical liquid as compared to minoxidil 5% solution found caffeine to be as effective as minoxidil at increasing the amount of anagen hairs over a 6-month period.[43]

The antifungal agent ketoconazole may play a role in alopecia treatment. The mechanism of action has not been fully elucidated, but the benefit may be due to anti-inflammatory effects or due to proposed anti-androgenic properties.[44] One study in mice comparing ketoconazole 2% solution, minoxidil 5% solution, and minoxidil 5%/tretinoin 0.1% solution applied once daily found all treatments to have a significant impact on hair growth as compared to control, though, the minoxidil groups had the best results.[45] Another study evaluated ketoconazole 2% emulsion for management of female pattern hair loss found similar benefit of ketoconazole 2% to minoxidil 2% solution. One study of ketoconazole 2% in a shampoo formulation (used once every 2-4 days, left on the scalp for 3-5 minutes prior to rinsing) found significant new hair growth after treatment between 1-3 months.[46]

Cetirizine has some anti-Prostaglandin D2 (PGD2) activity. PGD2 has been implicated as a causative factor in some types of alopecia (prostaglandin analogues, such as latanoprost or bimatoprost are prostaglandin F2 analogues, prostaglandin F2 and prostaglandin E are thought to have a stimulating effect on hair growth).[47] One study evaluating cetirizine 1% vs minoxidil 5% in 40 male patients with androgenetic alopecia noted a significant increase in total and vellus hair density in both groups, though, minoxidil was superior.[48] Another study evaluating cetirizine 1% in male and female patients noted increased hair density after 6 months of use over a control group. Levocetirizine, the R-enantiomer of cetirizine, is thought to be primarily responsible for much of cetirizine's activity. [49] Though levocetirizine has not been widely studied for alopecia at this time, some preliminary in vitro data suggests it may be beneficial.[50]

Amino acids arginine and levocarnitine are sometimes used in topical preparations for alopecia as well, though, data is currently limited. Arginine is often used at 1-2%, limited data suggests that arginine may be protective against oxidation of hair follicles and may also improve circulation.[51,52] Levocarnitine may play a role in down regulating apoptosis and stimulating proliferation. One placebo controlled, double-blind study evaluated levocarnitine tartrate 2% solution applied twice daily for 6 months. The study noted increased density of terminal hair and an increased anagen to telogen hair ratio.[53,54]

Recently, GHK-Cu (copper peptide) has also been garnering interest for potential use for alopecia. Few studies exist evaluating GHK-Cu for alopecia and so specific studies on effective concentration for this indication are unavailable, anecdotally some compounders use 0.2-3%. This concentration is similar to that used in GHK-Cu preparations for aging skin. The mechanism of action has not been fully elucidated, but it is thought that GHK-Cu may promote fibroblast proliferation resulting in collagen synthesis which may in turn promote increased scalp health and blood flow to hair follicles. GHK-Cu also suppresses the over expression of transforming growth factor-beta (TGF-β)1 that has been noted in patients with hereditary hair loss, leading to hair shaft thickening and elongation.[55,56]

GHK-Cu isn't the only antiaging active pharmaceutical ingredient under investigation for use for alopecia. Recently, sirolimus has gained attention as well as a possible alopecia treatment. Sirolimus has been studied topically alone or in combination with epigallocatechin gallate (EGCG – a green tea extract product) for alopecia. The proposed mechanism of action is anagen induction (induction of hair growth phase). Data is mainly in mice or vitro currently, but thus far has shown increased hair growth rate and hair follicle density with use of topical sirolimus. Studied concentrations in mice have been quite low, on the mcg level per application, with one study looking at concentrations from 0.2-20uM (equivalent ~0.18-18mcg/mL) anecdotally, concentrations currently being used for human use are higher up to 0.25%.[57,58]

Agents primarily used to treat alopecia areata, or immune related alopecia include tofacitinib, contact sensitizers (such as squaric acid dibutyl ester and diphencyclopropenone), and steroids. One study looking at diphencyclopropenone and squaric acid dibutyl ester sensitized patients with a 2% solution before decreasing to a much lower concentration (0.001%) 2 weeks later. Subsequently on a weekly basis the concentration was gradually increased (0.01%, 0.05%, 0.1%, 0.5%, 1% etc.) until mild dermatitis (erythema and pruritus) was noted and persisted for 48 hours. This final concentration was then applied weekly for 6 months. While both squaric acid dibutyl ester and diphencyclopropenone were found to be effective for alopecia areata, the squaric acid dibutyl ester group noted more significant hair regrowth than the diphencyclopropenone group.[65]

Data on tofacitinib for alopecia areata remains limited. Currently it has been studied at 2% topically and 5mg orally twice daily in patient populations in pediatric patients as well as adults. The proposed mechanism of action is attenuation of inflammatory cascade via JAK inhibition.[68.69] One case study of a patient with alopecia areata of the eyelashes found that after 4 months of treatment with tofacitinib 2% solution eyelashes regrew completely.[70] Another small study of 10 patients found improvement in 3 of the patients with the application of 2% ointment twice daily.[71]

Corticosteroids are another common treatment for the management of alopecia areata. One study of 28 patients suffering from alopecia universalis (a more severe form of alopecia areata) who applied 2.5g of 0.05% clobetasol propionate ointment for 6 months to one side of scalp resulted in some regrowth for 28.5% of patients.[72] Another trial of clobetasol propionate 0.05% applied twice daily in a 6 weeks on/6 weeks off cyclical fashion in pediatric patients also found the treatment to be safe and effective, more so than the use of weaker steroid hydrocortisone 1%.[73] Other potent steroids including betamethasone 0.05-0.1% and mometasone 0.005% have been studied and found efficacious as well.[74,45] Lower potency steroids are sometimes used in combination products for management of androgenetic alopecia as well. Though data is limited on the safety and efficacy of such combinations, literature suggests that inflammation may play a role in the pathogenesis of androgenetic alopecia as well leading some providers to add low concentrations of steroids such as fluocinolone acetonide 0.01%, or low potency steroids such as hydrocortisone 1% to some topical preparations for alopecia.[76]

New treatments continue to emerge for the management of alopecia in its various subtypes. Given the extremely limited number of FDA approved treatments, and even more limited number of approved topical treatments, compounding is often utilized as a tool for patients unable to achieve sufficient results with existing treatment. Compounding offers the opportunity to combine treatments with various mechanisms of action to better manage alopecia. For a more extensive list of treatments studied for alopecia, check out the **"Topical Active Ingredients Used in the Management of Alopecia"** table available under "Resource Documents" on our Fagron Academy website!

The Tricho Line: The Tricho vehicles all contain TrichoTech™, a patented essential oil combination that has been studied to help promote scalp health. An in vitro study of this essential oil blend noted that TrichoTech™ was found to increase expression of fibroblast growth factors (FGF-7 and FGF-10).[78] This data is promising as some studies suggest that FGFs promote hair growth by induction of anagen phase (growth phase) in resting hair follicles.[79] In addition to this in vitro data, there have been limited studies evaluating TrichoSol in human volunteers. One study of 20 female and male patients compared a control group (no treatment) to treatment with minoxidil 3% in a conventional alcohol vehicle, TrichoSol alone, and minoxidil 3% in TrichoSol. The study found that after 90 days of treatment all groups had increased hair in the anagen phase as compared to the control group, but an increased percentage of patients in the TrichoSol alone and TrichoSol in combination with minoxidil 3% groups were in anagen phase as compared to the minoxidil 3% in a conventional alcohol vehicle group.[80] Another study evaluated TrichoSol and TrichoFoam in 59 patients via patch test. No subjects presented clinical signs of irritation, sensitization, photoallergy, or phototoxicity as a result of patch testing. Similar testing was conducted in 52 patients with other vehicles containing TrichoTech™, including TrichoWash, TrichoCream, TrichoCond, and TrichoOil and similarly, none of the above signs of irritation or sensitization were reported as a result.[81]All Tricho vehicles are free of parabens, formaldehyde, benzyl alcohol, benzyl benzoate, petrolatum, lanolin, peanut oil, propylene glycol, and artificial colors. These bases are also free of common allergens including gluten, corn, soy, lactose, animal products, and genetically modified organisms (GMOs).

Vehicle	Water Activity	Utility for Alopecia	BUD Studies
TrichoSol	>0.6	Solution vehicles are commonly used in alopecia studies. Solutions may be left on the scalp and are nongreasy, easy to measure, and able to be packaged in a variety of different types of container closures for ease of use. TrichoSol can tolerate high API and solvent load.	• Cetirizine HCl 0.5-2.0%: 180 days BUD • Dutasteride 0.1%: 180 days BUD • Dutasteride >0.1%- 0.25%: 120 days BUD • Hydrocortisone acetate 0.5%: 180 days BUD • Hydrocortisone acetate >0.5 - 1%: 150 days BUD • Nicotinamide 0.25-0.5%: 180 days BUD • Progesterone 1.0%: 180 days BUD • Progesterone >1%- 2.5%: 90 days BUD • Pyridoxine HCl 0.25-5%: 180 days BUD • Minoxidil 1% through <7%: 150 days • Minoxidil 7%: stability persisted up to 380 days (max allowed 180 days) • Minoxidil 2-10%, Finasteride 0.1-0.5%, Fluocinolone Ac 0.01%: 180 days • Minoxidil 2-10%, Finasteride 0.1-0.5%: 180 days
TrichoFoam	>0.6	Foaming vehicles decrease risk of dripping compared to solution vehicles and offer a cosmetically	• Caffeine 0.1-2%: 180 days BUD • Clobetasol Propionate 0.01%: 150 days BUD

		elegant, nongreasy option for topical application. TrichoFoam can tolerate high API and solvent load, though, options are more limited than with TrichoSol as it is important to avoid breaking the emulsification system that generates the rich foam.	• Clobetasol Propionate 0.1%: 14 days BUD • Dutasteride 0.1%: 90 days BUD • Dutasteride >0.1-0.25% - 30 days BUD* • Nicotinamide 0.25-0.5%: 180 days BUD • Progesterone 0.25%: 120 days BUD • Progesterone >0.25-2.5%: 90 days BUD • Minoxidil 1% through <7%: 120 days BUD • Minoxidil 7%: 180 days BUD
TrichoCond	>0.6	Conditioners, while less commonly used as vehicles in alopecia studies, offer a cosmetically appealing option and are hydrating for topical use on the scalp.	None
TrichoWash	>0.6	Shampoo vehicles have been studied with various APIs, such as ketoconazole, for topical use for alopecia. Shampoo vehicles offer a vehicle for easy application and rinsing.	None
TrichoOil	<0.6	TrichoOil is an anhydrous vehicle that offers extended BUD due to its low water activity. Oil vehicles are a good option for patients with dry scalp or those with areas of complete baldness, such as those suffering from alopecia areata.	None (though extended BUD is permitted per USP <795> given water activity is <0.6)
TrichoCream	>0.6	Creams have been utilized as vehicles in some alopecia studies, such as those with steroids for alopecia areata or those evaluating metformin for topical use among others. TrichoCream is a rich hydrating topical option with a moderate API carrying capacity.	None

Formula ID	Formula Name
FA-23562	Minoxidil 7% Topical Foaming Solution (**TrichoFoam**™)(BUD Study)
FA-23241	Minoxidil 5% - Azelaic Acid 12.5% - Finasteride 0.1% - Ketoconazole 2% Topical Solution (**TrichoSol**™)
FA-24234	Minoxidil 7.5% - Finasteride 0.1% Topical Solution (**TrichoSol**™)(BUD Study)
FA-24080	Minoxidil 10% - Fluocinolone Acetonide 0.01% - Finasteride 0.25% Topical Solution (**TrichoSol**™)(BUD Study)
FA-24074	Minoxidil 5% - Fluocinolone Acetonide 0.01% - Finasteride 0.1% Topical Solution (**TrichoSol**™)(BUD Study)
FA-24072	Minoxidil 7% - Finasteride 0.5% Topical Solution (**TrichoSol**™)(BUD Study)
FA-24388	Minoxidil 5%, Ketoconazole 2% Topical Foam (**TrichoFoam**™)(BUD Study)
FA-23559	Dutasteride 0.1% Topical Foaming Solution (**TrichoFoam**™)(BUD Study)
FA-24381	Minoxidil 5%, Dutasteride 0.25% Topical Foam (**TrichoFoam**™)(BUD Study)
FA-23492	Dutasteride 0.25% Solution (**TrichoSol**)(BUD Study)
FA-23493	Progesterone 2% Solution (**TrichoSol**)(BUD Study)
FA-23130	Minoxidil 5% - Dutasteride 0.1% Topical Solution (**TrichoSol**™)
FA-24385	Minoxidil 7%, Finasteride 0.25% Topical Foam (**TrichoFoam**™)(BUD Study)
FA-23085	Minoxidil 7% - Spironolactone 0.5% - Caffeine 0.2% Topical Solution (**TrichoSol**)

FA-23044	Bimatoprost 0.03% Foam (**TrichoFoam**)
FA-23024	Minoxidil 7% - Spironolactone 0.5% - Arginine 1% Topical Solution (**TrichoSol™**)
FA-22958	Minoxidil 5% - Biotin 0.1% - Melatonin 0.1% Topical Solution (**TrichoSol™**)
FA-22934	Minoxidil 8% - Tretinoin 0.01% - Finasteride 0.25% - Hydrocortisone 1% Foam (**TrichoFoam**)
FA-22929	Latanoprost 0.1% Cream (**TrichoCream**)
FA-22783	Minoxidil 5% - Caffeine 1% - Azelaic Acid 1.5% Foam (**TrichoFoam**)
FA-22714	Caffeine 0.2% Topical Shampoo (**TrichoWash™**)
FA-22683	Minoxidil 3% - Finasteride 0.1% Topical Emulsion (**TrichoOil™**)
FA-24511	Dutasteride 0.05% Topical Emulsion (Alcohol and Propylene Glycol Free)(**TrichoOil**)
FA-22674	Metformin HCl 10% Cream (**TrichoCream™**)

References:

1. Rhodes T, Girman C, Savin R. Prevalence of male pattern hair loss in 18-49 year old men. Dermatol Surg. 1998; 24(12):1330-2.
2. Levy L, Erner J. Female pattern alopecia: current perspectives. Int J Womens Health. 2013; 5: 541-556.
3. Gordon K, Totsi A. Alopecia: evaluation and treatment. Clin Cosmet Investig Dermatol. 2011; 4: 101-106.
4. Olsen E, Dunlap F, Funicella T. A randomized clinical trial of 5% topical minoxidil versus 2% topical minoxidil and placebo in the treatment of androgenetic alopecia in men. J Am Acad Dermatol. 2002; 47)3):377-85.
5. Ho CH, Sood T, Zito PM. Androgenetic Alopecia. [Updated 2024 Jan 7]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK430924/
6. Qi J, Garza L. An overview of alopecias. Cold Spring Harb Perspect Med. 2014; 4(3):a013615. 10.1101/cshperspect.a013615.
7. Hoedemaker C, van Egmond S, Sinclair R. Treatment of female pattern hair loss with a combination of spironolactone and minoxidil. Australas J Dermatol. 2007; 48(1):43-45.
8. Ghonemy S, Alarawi A, Bessar H. Efficacy and safety of a new 10% topical minoxidil versus 5% topical minoxidil and placebo in the treatment of male androgenetic alopecia: a trichoscopic evaluation. J Dermatolog Treat. 2021;32(2):236-241. doi:10.1080/09546634.2019.1654070
9. Goldust M. Minoxidil 15% solution versus minoxidil 5% solution in the treatment of androgenetic alopecia. Br J Dermatol 2020; 183(Suppl): 91 (abstract BH107).
10. Shreya Singh, Anant Patil, Nika Kianfar, Anna Waśkiel-Burnat, Lidia Rudnicka, Rodney Sinclair, Mohamad Goldust, Does topical minoxidil at concentrations higher than 5% provide additional clinical benefit?, Clinical and Experimental Dermatology, Volume 47, Issue 11, 1 November 2022, Pages 1951–1955, https://doi.org/10.1111/ced.15338
11. McCoy J, Goren A, Kovacevic M, Shapiro J. Minoxidil dose response study in female pattern hair loss patients determined to be non-responders to 5% topical minoxidil. J Biol Regul Homeost Agents. 2016;30(4):1153-1155.
12. McCoy J, Kovacevic M, Situm M, Stanimirovic A, Bolanca Z, Goren A. Doppler laser imaging predicts response to topical minoxidil in the treatment of female pattern hair loss. J Biol Regul Homeost Agents. 2016;30(1):131-134.
13. Mazzarella F, Loconsole F, Cammisa A, Mastrolonardo M, Vena GA. Topical finasteride in the treatment of androgenic alopecia. Preliminary evaluations after a 16-month therapy course. J Dermatol Treat. 1997; 8: 189-92.
14. Hajheydari Z, Akbari J, Saeedi M, Shokoohi L. Comparing the therapeutic effects of finasteride gel and tablet in treatment of the androgenic alopecia. Indian J Dermatol Venereol Leprol. 2009; 1(75): 47-51.
15. Suchonwanit P, Srisuwanwattana P, Chalermroji N, Khunkhet S. A randomized, double-blind controlled study of the efficacy and safety of topical solution of 0.25% finasteride admixed with 3% minoxidil vs 3% minoxidil solution in the treatment of male androgenetic alopecia. J Eur Acad Dermatol Venereol. 2018;32(12):2257-2263. Doi: 10.1111/jdv/15171.
16. Won Lee S, Juhasz M, Mobasher P, Ekelem C, Mesinkovska N. A systemic review of topical finasteride in the treatment of androgenetic alopecia in men and women. Journal of Drugs in Dermatology. 2018; 4(17): 457-463.
17. Rossi A, Caro G. Efficacy of the association of topical minoxidil and topical finasteride compared to their use in monotherapy in men with androgenetic alopecia: A prospective, randomized, controlled, assessor blinded, 3-arm, pilot trial. Journal of Cosmetic Dermatology. 2023; 23(2): 502-509.

18. Caserini M1, Radicioni M, Leuratti C, et al. A novel finasteride 0.25% topical solution for androgenetic alopecia: pharmacokinetics and effects on plasma androgen levels in healthy male volunteers. Int J Clin Pharmacol Ther. 2014;52(10):842–9
19. Shanshanwal SJ, Dhurat RS. Superiority of dutasteride over finasteride in hair regrowth and reversal of miniaturization in men with androgenetic alopecia: A randomized controlled open-label, evaluator-blinded study. Indian J Dermatol Venereol Leprol. 2017;83(1):47-54. doi:10.4103/0378-6323.188652
20. Narasimhalu C. A cross-sectional randomized comparative study of topical minoxidil solution with and without finasteride in male pattern androgenetic alopecia in South Indian patients. International Journal of Research in Dermatology. 2018; 4(1):46-49.
21. Study Details | Clinical Trial of Safety and Efficacy of Daily Application of Topical Dutasteride in Men With Androgenic Alopecia. | ClinicalTrials.gov
22. Rafi A, Katz R. Pilot study of 15 patients receiving a new treatment regimen for androgenic alopecia: the effects of atopy on AGA. International Scholarly Research Notices. 2011; https://doi.org/10.5402/2011/241953
23. Shin H, Won C, Lee S, Kwon 0, Kim K, Eun H. Efficacy of 5% minoxidil versus combined 5% minoxidil and 0.01% tretinoin for male pattern hair loss. American Journal of Clinical Dermatology. 2007; 8(5): 285-290.
24. Inui S, Itami S. Reversal of androgenic alopecia by topical ketoconazole: relevance of anti-androgenic activity. Journal of Dermatological Science. 2007; 45(1): 66-68.
25. Pierard-Franchimont C, De Doncker P, Cauwenbergh G, Pierard G. Ketoconazole shampoo: effect of long-term use in androgenic alopecia. Dermatology. 1998; 196(4):474-7.
26. Jian J, Tsuboi R, Kojima Y, Ogawa H. Topical application of ketoconazole stimulates hair growth in C3H/HeN Mice. The Journal of Dermatology. 2005; 32(4):243-7.
27. Aldhalimi M, Hadi N, Ghafil F. Promotive effect of topical ketoconazole, minoxidil, and minoxidil with tretinoin on hair growth in male mice. ISRN Pharmacology. Vol 2014, Article ID 575423, 5 pages, 2014. https://doi.org/10.1155/2014/575423.
28. Sharma A, Gornen A, Shurat R et al. Tretinoin enhances minoxidil response in androgenetic alopecia patients by upregulating follicular sulfotransferase enzymes. Dermatologic Therapy. 2019. https://doi.org/10.1111/dth.12915
29. Unal M. Use of adapalene in alopecia areata: Efficacy and safety of mometasone furoate 0.1% cream versus combination of mometasone furoate 0.1% cream and adapalene 0.1% gel in alopecia areata. Dermatol Ther. 2018;31(1):10.1111/dth.12574. doi:10.1111/dth.12574
30. Dill-Muller D, Zaun H. Topical treatment of androgenetic alopecia with spironolactone. J Eur Acad Dermatol Venereol. 1997 Sep;9(Suppl 1):31.
31. Soliman A, Hussein S, Hosam S et al. Assessment of the efficacy of topical antiandrogen; spironolactone in patients with androgenetic alopecia by dermoscopy. Journal of Pakistan Association of Dermatologists. 2022; 32(3): 493-501.
32. Ammar A, Elshahid A, Abdel-Dayem H et al. Dermoscopic evaluation of the efficacy of combination of topical spironolactone 5% and minoxidil 5% solutions in the treatment of androgenetic alopecia: A cross sectional-comparative study. Journal of Cosmetic Dermatology. 2022; 21(11): 5790-5799.
33. Shamsaldeen 0, Mubki T, Shapiro J. Topical Agents for Hair Growth Promotion: What is Out There. Skin Therapy Letter. 2013; 18(4): https://www.skintherapyletter.com/alopecia/growth-promotion/
34. Orfanos CE, Vogels L. [Local therapy of androgenetic alopecia with 17-alphaestradiol. A controlled, randomized, double- blind study (author's transl)]. Dermatologica. 1980; 161(2):124-32
35. Babaii N, Khodaiani E, Herizchi H. Comparison of effects of 2%topical minoxidil solution with 2% topical progesterone in the treatment of female pattern androgenetic alopecia. 2006l 28(2):19-22.
36. Thanomkitii K, Pruksaeakanan C, Subchookul C et al. Efficacy and safety of topical 5% azelaic acid solution versus 2% minoxidil solution in the treatment of female pattern hair loss. Siriraj Medical Journal. 2023; 75(12): 887-893.
37. Volker J, Koch N, Vecker M, Klenk A. Caffeine and its pharmacological benefits in the management of androgenetic alopecia: A review. 2020; 33(3): 153-169.
38. Rafati M, Mahmoudian R, Golpour M, Kazeminejad A, Saeedi M, Nakoukar Z. The effect of latanoprost 0.005% solution in the management of scalp alopecia areata, a randomized double-blind placebo-controlled trial. Dermatologic Therapy. 2022. https://doi.org/10.1111/dth.15450.

39. Blume-Peytavi U, Lonnfors S, Hillmann K, Garcia Bartels N. A randomized double-blind placebo-controlled pilot study to assess the efficacy of a 24-week topical treatment by latanoprost 0.1% on hair growth and pigmentation in healthy volunteers with androgenetic alopecia. J Am Acad Dermatol. 2012; 66(5): 794-800.
40. Zaher H, Gawdat HI, Hegazy RA, Hassan M. Bimatoprost versus mometasone furoate in the treatment of scalp alopecia areata: A Pilot Study. Dermatology. 2015;230:308–13.
41. Tabri, Farida & Anwar, Anis & Adriani, Anni & Aryaningrum, Dwi. (2018). The Effectiveness of 0.03% Bimatoprost Solution Vs Minoxidil 5% in Androgenic Alopecia. Indian Journal of Public Health Research & Development. 9. 1444. 10.5958/0976-5506.2018.02056.9.
42. Fischer T, Trueb R, Hanggi G, Innocenti M, Elsner P. Topical melatonin for treatment of androgenetic alopecia. Int J Trichology. 2012; 4(4):236-245
43. Dhurat R, Chitallia J, May T et al. An open-label randomized multicenter study assessing the noninferiority of a caffeine- based topical liquid 0.2% versus minoxidil 5% solution in male androgenetic alopecia. Skin Pharmacol Physiol. 2018; 30(6): 298- 305
44. El-Garf, A., Mohie, M. & Salah, E. Trichogenic effect of topical ketoconazole versus minoxidil 2% in female pattern hair loss: a clinical and trichoscopic evaluation. biomed dermatol 3, 8 (2019). https://doi.org/10.1186/s41702-019-0046-y
45. Aldhalimi MA, Hadi NR, Ghafil FA. Promotive effect of topical ketoconazole, minoxidil, and minoxidil with tretinoin on hair growth in male mice. ISRN Pharmacol. 2014;2014:575423. Published 2014 Mar 9. doi:10.1155/2014/575423
46. Rafi AW, Katz RM. Pilot Study of 15 Patients Receiving a New Treatment Regimen for Androgenic Alopecia: The Effects of Atopy on AGA. ISRN Dermatol. 2011;2011:241953. doi:10.5402/2011/241953
47. Shin DW. The physiological and pharmacological roles of prostaglandins in hair growth. Korean J Physiol Pharmacol. 2022;26(6):405-413. doi:10.4196/kjpp.2022.26.6.405
48. Hossein Mostafa D, Samadi A, Niknam S, Nasrollahi SA, Guishard A, Firooz A. Efficacy of Cetirizine 1% Versus Minoxidil 5% Topical Solution in the Treatment of Male Alopecia: A Randomized, Single-blind Controlled Study. J Pharm Pharm Sci. 2021;24:191-199. doi:10.18433/jpps31456
49. Rossi A., Campo D., Fortuna M.C., Garelli V., Pranteda G., De Vita G., Sorriso-Valvo L., Di Nunno D., Carlesimo M. A preliminary study on topical cetirizine in the therapeutic management of androgenetic alopecia. J. Dermatolog. Treat. 2018;29:149–151. doi: 10.1080/09546634.2017.1341610.
50. Wen S, Wei J, Bao J, et al. Effect of levocetirizine hydrochloride on the growth of human dermal papilla cells: a preliminary study. Ann Palliat Med. 2020;9(2):308-317. doi:10.21037/apm.2020.01.15
51. Reygagne P, Mandel V, Delva C et al. An anti-hair loss treatment in the management of mild androgenetic alopecia: results form a large, international, observational study. Dermatologic Therapy. 2021. https://doi.org/10.1111/dth.15134
52. Foitzik K, Hoting E, Förster T, Pertile P, Paus R. L-carnitine-L-tartrate promotes human hair growth in vitro. Exp Dermatol. 2007 Nov;16(11):936-45. doi: 10.1111/j.1600-0625.2007.00611.x. PMID: 17927577.
53. Foitzik K, Hoting E, Heinrich U et al. Indications that topical l-carnitin-l-tartrate promotes human hair growth in vivo. Journal of Dermatological Science. 2007; 48(2): P141-144.
54. Eder K, Felgner J, Becker K, Kluge H. Free and total carnitine concentrations in pig plasma after oral ingestion of various L-carnitine compounds. Int J Vitam Nutr Res. 2005 Jan;75(1):3-9. doi: 10.1024/0300-9831.75.1.3. PMID: 15830915.
55. Pickart L, Margolina A. Regenerative and Protective Actions of the GHK-Cu Peptide in the Light of the New Gene Data. Int J Mol Sci. 2018;19(7):1987. Published 2018 Jul 7. doi:10.3390/ijms19071987
56. Sadgrove NJ, Simmonds MSJ. Topical and nutricosmetic products for healthy hair and dermal antiaging using "dual-acting" (2 for 1) plant-based peptides, hormones, and cannabinoids. FASEB Bioadv. 2021;3(8):601-610. Published 2021 Jun 6. doi:10.1096/fba.2021-00022
57. Suzuki T, Chéret J, Scala FD, et al. mTORC1 activity negatively regulates human hair follicle growth and pigmentation. EMBO Rep. 2023;24(7):e56574. doi:10.15252/embr.202256574
58. Lin Y, Shao R, Xiao T, Sun S. Promotion of Hair Regrowth by Transdermal Dissolvable Microneedles Loaded with Rapamycin and Epigallocatechin Gallate Nanoparticles. Pharmaceutics. 2022;14(7):1404. Published 2022 Jul 4. doi:10.3390/pharmaceutics14071404
59. Q Dinh, R Sinclair. Female pattern hair loss: current treatment concepts. Clin Interv Aging. 2007; 2(2):189-199

60. Lenane P, Macarthur C, Parkin P. Clobetasol propionate, 0.05%, vs hydrocortisone, 1%, for alopecia areata in children. JAMA Dermatol. 2014; 150(1):47-50. Doi:10.1001/jamadermatol.2013.5764
61. Tosti A, Piraccini B, Pazzaglia M, Vincenzi C. Clobetasol propionate 0.05% under occlusion in the treatment of alopecia totalis/universalis. J Am Acad Dermatol. 2003; 49(1):96-98
62. Micali G, Cicero R, Nasca M, Sapuppo A. Treatment of alopecia areata with squaric acid dibutylester. Int J Dermatol. 1996; 35(1):52-6
63. Chua S, Goh C, Ang C. Topical squaric acid dibutylester therapy for alopecia areata: a double-sided patient-controlled study. Ann Acad Med Singapore. 1996; 25(6):842-7
64. Zerbinati N, Esposito C, D'Este E, Calligaro A, Valsecchi R. Topical immunotherapy of alopecia areata: a large retrospective study. Dermatol Ther (Heidelb). 2018; 8(1): 101-110
65. Tiwary A, Mishra D, Chaudhary S. Comparative study of efficacy and safety of topical squaric acid dibutylester and diphenylcyclopropenone for the treatment of alopecia areata. North American Journal of Medical Sciences. 2016; 6(8): 237-242
66. Alsantali A. Alopecia areata: a new treatment plan. Clin Cosmet Investig Dermatol. 2011; 4:107-115
67. Mancuso G, Balducci A, Casadio C, et al. Efficacy of betamethasone valerate foam formulation in comparison with betamethasone dipropionate lotion in the treatment of mild-to-moderate alopecia areata: a multicenter, prospective, randomized, controlled, investigator-blinded trial. Int J Dermatol. 2003;42(7):572-575
68. Craiglow BG. Topical tofacitinib solution for the treatment of alopecia areata affecting eyelashes. JAAD Case Rep. 2018;4(10):988-989. Published 2018 Oct 30. doi:10.1016/j.jdcr.2018.07.018
69. Behrangi E, Barough M, Khoramdad M et al. Efficacy and safety of tofacitinib for treatment of alopecia areata in children: a systematic review and meta-analysis. Journal of Cosmetic Dermatology. 2022; https://doi.org/10.1111/jocd.15425
70. Shivanna CB, Shenoy C, Priya RA. Tofacitinib (Selective Janus Kinase Inhibitor 1 and 3): A Promising Therapy for the Treatment of Alopecia Areata: A Case Report of Six Patients. Int J Trichology. 2018;10(3):103-107. doi:10.4103/ijt.ijt_21_18
71. Liu L, Craiglow B, King B. Tofacifinib 2% ointment, a topical Janus kinase inhibitor, for the treatment of alopecia areata: a pilot study of 10 patients. JAAD. 2018; 78(2): 403-404.
72. Tosti A, Piraccini BM, Pazzaglia M, Vincenzi C. Clobetasol propionate 0.05% under occlusion in the treatment of alopecia totalis/universalis. J Am Acad Dermatol. 2003;49(1):96-98. doi:10.1067/mjd.2003.423
73. Lenane P, Macarthur C, Parkin PC, et al. Clobetasol Propionate, 0.05%, vs Hydrocortisone, 1%, for Alopecia Areata in Children: A Randomized Clinical Trial . JAMA Dermatol. 2014;150(1):47–50. doi:10.1001/jamadermatol.2013.5764
74. Alsantali A. Alopecia areata: a new treatment plan. Clin Cosmet Investig Dermatol. 2011;4:107-115. doi:10.2147/CCID.S22767
75. Sibbald C. Alopecia Areata: An Updated Review for 2023. J Cutan Med Surg. 2023;27(3):241-259. doi:10.1177/12034754231168839
76. Trueb R. Molecular mechanisms of androgenetic alopecia. Experimental gerontology. 2002; 37(8-9_: 981-990.
77. Fischer T, Burmeister, Schmidt, Elsner. Melatonin increases anagen hair rate in women with androgenetic alopecia or diffuse alopecia: results of a pilot randomized controlled trial. British Journal of Dermatology 2004; 150: 341-345
78. Amaral F, Jardim M, Maria de Souza Antunes V et al. In vitro effects of the Phytocomplex TrichoTech on human fibroblasts: proliferative potential and effects on gene expression of FGF-7 and FGF-10. Journal of Cosmetics, Dermatological Sciences, and Applications. 2017; 7(1): doi: 10.4236/jcdsa.2017.71001
79. Lin WH, Xiang LJ, Shi HX, et al. Fibroblast growth factors stimulate hair growth through β-catenin and Shh expression in C57BL/6 mice. Biomed Res Int. 2015;2015:730139. doi:10.1155/2015/730139
80. Pucci A, Oliveira A, Amaral F, Oliveira C. Effect of Trichosol on increasing the anagen phase of the capillary cycle of volunteers. Journal of Cosmetology and Trichology. 2019; 5(1): doi: 10.4172/2471-9323.1000139
81. Marianni B, Polonini H, Carolina S. Clinical Safety Profile of TrichoConcept, a Line of Cosmetic Vehicles for Personalized Treatment of Alopecia. IJPC. 2024; 28(2): 169-175
82. Panuganti VK, Kumar Madala P, Ramalingayya Grandhi V, Varma Alluri C, Mohammad J, Rao Kssvv S, Reddy Dundigalla M. A Randomized, Double-Blind, Placebo and Active Controlled Phase II Study to Evaluate the Safety and Efficacy of Novel Dutasteride Topical Solution (0.01%, 0.02%, and 0.05% w/v) in Male Subjects With

Androgenetic Alopecia. Cureus. 2025 Aug 3;17(8):e89309. doi: 10.7759/cureus.89309. PMID: 40909044; PMCID: PMC12405733.