

Active Ingredient Summary Table

Alopecia

| Active Pharmaceutical Ingredient | Mechanism of Action (MoA) | Type of Alopecia Treated/Treatment Group | Dosing | Studies |
|----------------------------------|---|--|--|--|
| Anthralin | The mechanism for anthralin in alopecia areata has not been fully elucidated, it is primarily used topically for psoriasis as it has anti-proliferative effects, it may also have anti-inflammatory effects | Alopecia areata, tested in men and women ^{31,33} | 0.5-1% cream applied topically daily | Results concerning anthralin are mixed, one study evaluating 0.5%-1% cream found response in 25% of patients, but another in combination with minoxidil found only 11% acceptable hair regrowth ^{33,34} |
| Azelaic Acid | Inhibits 5-alpha-reductase, involved in inhibiting conversion of testosterone to DHT ⁵⁰ | Alopecia areata, tested in men and women ⁴⁸ | 20% cream for alopecia areata ⁴⁸ , 1.5% in combo with minoxidil 5%, caffeine 1% also tested ⁴⁹ | Study evaluating azelaic acid 20% vs anthralin over 12 weeks. Treatments were found to be equally effective for both treatment groups ⁴⁸ Azelaic acid 1.5% with minoxidil 5%, caffeine 1% demonstrated superior to minoxidil alone in placebo controlled 32 week trial. |
| Betamethasone | Immune suppression, as an autoimmune disorder, alopecia areata can be treated by immunosuppressant drugs | Alopecia areata, less effective for alopecia totalis and alopecia universalis, can be for men or women | 0.1% betamethasone valerate foam preferred over 0.05% lotion ^{31,32} | Study evaluating betamethasone valerate foam vs betamethasone dipropionate lotion found 61% of those on betamethasone valerate achieved more than 75% hair regrowth compared to only 27% in the lotion group. ³¹ |
| Bimatoprost | Prostaglandin mediated anagen induction. Latanoprost and bimatoprost are prostaglandin analogues ²⁰ | Alopecia areata and androgenetic alopecia | 0.03% topical solution | Study evaluating bimatoprost 0.03% topical solution twice daily for three months vs mometasone furoate for alopecia areata found the bimatoprost to be significantly more effective. ⁵⁴ Another study comparing it to 5% |

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| | | | | minoxidil also found no statistically significant difference between the two groups regarding hair growth. ⁵⁵ |
| Bexarotene | Vitamin A related compound that binds to retinoid X receptors. Mechanism not entirely clear, but may be similar to tretinoin (i.e. causing contact dermatitis) | Alopecia areata, tested in men and women | 1% gel | Study found that 12% of patients had 50% or more partial hair regrowth on the treated side, 14% on both sides, however, many of the patients experienced irritation in response to treatment ³⁸ |
| Biotin | Biotin, Vitamin B7, is a common oral supplement for hair loss however despite biotin deficiency being a common finding in women experiencing hair loss ⁴² mechanism of action is not totally clear. Could be related to mitochondrial function in hair root cells as a cofactor ⁴³ | Most studies evaluate oral biotin between 1-10mg and find benefit in patients with genetic or iatrogenic reasons for hair loss ⁴⁴ | Though no studies currently exist that I could find, if biotin is used it is often between 0.1-0.5% | Though studies on the benefit of oral supplementation have demonstrated benefit in specific populations, studies on topical use are not yet available. Evidence for use is mainly anecdotal. |
| Caffeine | A possible mechanism is increased cAMP via phosphodiesterase inhibition resulting in increased cell proliferation of follicles (combating DHT induced miniaturization of the follicle) ²³ | Androgenetic alopecia tested, though possible use in other non-cicatricial alopecia types. Tested in men | 0.2% topical liquid | One 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. ²³ |
| Cetirizine | Cetirizine has some anti-PGD2 activity, prostaglandin D2 has been implicated as a causative factor in some alopecias ⁴⁶ | Studied in androgenetic alopecia | 1% topical cream or liquid | Study evaluating cetirizine 1% vs placebo noted significant improvement in total hair density and decrease in vellus hair density. No adverse effects reported ⁴⁶ |

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| Clobetasol | Clobetasol as a steroid may have immunosuppressive benefits in the management of alopecia areata | Alopecia areata ²⁵ Studied in men and women as well as children | 0.05% topical cream or ointment | Study of 28 patients with alopecia areata who applied 2.5g of 0.05% ointment for 6 months to one side of scalp resulted in some regrowth for 28.5% of patients ²⁶ |
| Diphencyclopropenone | Acts as a contact allergen. The mechanism has not been fully elucidated, but it is hypothesized that the inflammatory response that is causing the hair loss is redirected | Alopecia areata ³¹ , Tested in men and women | Generally, an initial treatment of 2% is applied followed by a much lower concentration (perhaps 0.001%) after 2 weeks and gradually increased (on a weekly basis) | Response rate (considered to be 75% or greater terminal hair regrowth) in one study was 77% cumulatively and 17.4% for those suffering from alopecia totalis/universalis ^{31,35} |
| Dutasteride | Only known medication which blocks both type I and II 5-alpha reductase, more potent inhibition than finasteride, which shares a similar mechanism of action, resulting in inhibition of conversion of testosterone to DHT resulting in decreased DHT in serum and scalp ⁵¹ | Androgenetic alopecia, studied in men ⁵¹ and women ⁵³ | Orally 2.5mg in men ⁵² and 0.15mg orally in women ⁵³ Topical dutasteride strengths not reported in literature at this time, but 0.25% is common | Limited data is available on topical use. Dutasteride 2.5mg orally daily was observed to be more effective than finasteride 5mg or placebo over a 24 week study in men. ⁵² 0.15mg daily orally in women also demonstrated benefit for androgenetic alopecia ⁵³ |
| EGCG (Green Tea Extract) | EGCG acts as an antioxidant and is thought to perhaps have some inhibitory effect on 5-alpha reductase therefore preventing formation of DHT. It may also stimulate growth of human dermal papilla cells via upregulation of phosphorylated Erk and Akt | Androgenetic alopecia ⁴¹ and possibly general hair loss as well | 10% solution | An Ex vivo study found 10% EGCG solution to result in significant follicle elongation ⁴¹ |
| Estradiol | A possible mechanism is estrogen induced increase in glycoprotein sex hormone-binding globulin | Androgenetic alopecia. Studied in women | 0.025% topical lotion | One 6-month long study evaluating estradiol 0.025% topical lotion in patients with androgenetic alopecia found a decrease in hair loss, however, |

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| | leading to decreased free testosterone. ¹⁹ | | | regrowth of new hairs was not demonstrated ¹⁹ |
| Finasteride | Inhibition of type II 5-alpha reductase inhibiting conversion of testosterone to DHT resulting in decreased DHT in serum and scalp. ^{8,9} | Androgenetic alopecia. Studied in men and women | 0.005% solution to 1% gel (wide variability) | Finasteride 0.005% has been tested in men and women and statistically significant benefit was observed. ⁷ 1% finasteride gel formulation vs finasteride oral tablets in men and found efficacy with the topical gel. ⁸ 0.25% finasteride in combination with 3% minoxidil vs 3% minoxidil alone the combination therapy with significantly superior to minoxidil alone. ^{9,10} |
| Fluocinolone Acetonide | Immune suppression, as an autoimmune disorder, alopecia areata can be treated by immunosuppressant drugs | Alopecia areata ⁴⁷ | 0.2% Fluocinolone acetonide cream twice daily ⁴⁷ | Fluocinolone ac 0.2% cream twice daily (under occlusion at night) found regrowth of hair in 54% of treatment group compared with 0% of vehicle group ⁴⁷ |
| Ketoconazole | Unclear mechanism of action, possibly due to anti-inflammatory effects ¹⁸ | Androgenetic alopecia. Studied in men | 2% lotion or shampoo | Some limited studies in humans of ketoconazole 2% lotion or shampoo have shown benefit for some patients, and other studies in mice have noted hair regrowth as well, though the improvement was not as significant as minoxidil compared to the placebo group. ^{13,14,15,16} |
| Latanoprost | Prostaglandin mediated anagen induction. Latanoprost and bimatoprost are prostaglandin analogues ²⁰ | Androgenetic alopecia. Studied in men | 0.1% solution | Increased hair density observed with latanoprost 0.1% solution at 24 weeks as compared to placebo |

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| Melatonin | Though the mechanism of action isn't totally clear, melatonin appears to induce anagen phase. ²¹ Some have postulated this is due to its antioxidant properties and anti-apoptotic effects ²² | Androgenetic alopecia and general (non-cicatricial) hair loss. Benefits for both men and women | 1ml of 0.1% | Melatonin 0.1% solution was applied to the scalps of these women resulting in increased hair growth as compared to the placebo group. ^{21,22} |
| Minoxidil | Topical vasodilator that prolongs anagen phase and increases the size of smaller hair follicles. Proposed mechanism involves modulation of prostaglandin levels. | Androgenetic alopecia and general (non-cicatricial) hair loss. Benefits for both men and women | 2-5% topical solution | Topical minoxidil has been well studied in both men and women at both 2 and 5%. Studies have demonstrated the superior efficacy of 5% minoxidil over 2% minoxidil twice daily with one study reporting 45% more hair growth in the 5% minoxidil group. ^{4,6} |
| Spironolactone | Competitive inhibition of androgen receptors, systemically inhibits ovarian androgen production. ²⁴ | Androgenetic alopecia. Studied in women | 1% topical solution and oral use | One study of 60 female patients found a spironolactone 1% topical to be effective at promoting hair growth, however, the study has not been repeated and benefit has not been studied in men. ^{17,18} |
| Squaric Acid Dibutylester | Acts as a contact allergen. The mechanism has not been fully elucidated, but it is hypothesized that the inflammatory response that is causing the hair loss is redirected | Alopecia areata ²⁷ Studied in men and women as well as children ²⁹ | Generally, an initial treatment of 2% is applied followed by a much lower concentration (perhaps 0.001%) after 1-2 weeks and gradually increased (on a weekly basis) until the pt has a reaction usually resulting in 0.01-1% final concentration for therapy ^{29,30} | A prospective, double-sides patient-controlled trial found that sensitization with 2% SADBE followed by weekly application resulted in "excellent response" in 60% of those treated on the treated sites. ²⁸ Another comprehensive review determined that 44.05% of patients using this therapy experienced at least 50% of terminal hair regrowth. ²⁹ Fun fact: A retrospective study found that topical irritants in combination with oral |

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| | | | | fexofenadine resulted in statistically significant greater hair regrowth ³⁷ |
| Tofacitinib (Xeljanz) | Attenuation of inflammatory cascade via JAK inhibition may play a role ³⁹ | Alopecia areata. Studied in both men and women | Has been used orally for alopecia areata, or topically at 1 to 2% solution for eyelashes ³⁹ or 2% ointment to the scalp (authors theorized oint may be bad vehicle choice) ⁴⁰ | Case study of patient with alopecia areata of the eyelashes found that after 7mo of treatment with tofacitinib 2% solution eyelashes regrew completely. ³⁹ Another small study of 10 patients found improvement in 3 with the application of 2% ointment ⁴⁰ |
| Tretinoin | Known to increase percutaneous absorption of minoxidil therefore could assist in getting minoxidil to site of action ¹² Additionally, may have own benefit by causing contact dermatitis ³¹ | Androgenetic alopecia, studied in men (though mechanism could also apply to women). Also alopecia areata, studied in men and women | Tretinoin 0.01% topical solution in combo with minoxidil ¹² or up to 0.05% as a solo agent ³¹ | One study of once daily tretinoin 0.01% with minoxidil 5% vs twice daily minoxidil 5% found that once daily combination therapy was as effective as twice daily minoxidil treatment. ¹² In one study 0.05% tretinoin resulted in response from 55% of patients ^{31,36} |
| Valproic Acid | Inhibits glycogen synthase kinase 3-beta and activates other pathways (Wnt/beta-catenin), that are associated with hair growth cycle and the induction of anagen (growth) phase ⁴⁵ | Studied in men with androgenetic alopecia, though could conceivably apply to other populations ⁴⁵ | Sodium valproate 8.3% topical spray ⁴⁵ | Study of 8.3% sodium valproate vs placebo spray for 24 weeks found mean increase in total hair count in VPA group as compared to placebo. No significant adverse events reported ⁴⁵ |

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