

# Common contact allergens implicated in frontal fibrosing alopecia found in over-the-counter hair growth serums and solutions

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## ABSTRACT

**Background:** Frontal fibrosing alopecia (FFA) is a form of lichen planopilaris with an undetermined etiopathogenesis, predominantly affecting women. There is conflicting evidence as to whether contact allergens may play a role in the underlying etiology or progression of FFA.

**Objective:** The aim of this study is to find the most common products that patients search for online, identify contact allergens present in these advertised over-the-counter hair products, and suggest their role in the development or exacerbation of FFA.

**Methods:** We reviewed current research on this topic and then investigated common allergens found in over-the-counter hair products commonly used for hair regrowth.

**Results:** FFA's exact etiopathogenesis remains vastly unknown, however, current literature has reported an association between inflammatory skin conditions and FFA.

**Limitations:** The lack of published data on the function of contact allergens in FFA placed restrictions on our study.

**Conclusion:** A survey-based analysis with a larger cohort is needed to further interpret the relationship between product use and FFA presentation based on contact allergens. More research on possible etiopathogenesis and the relationship between contact dermatitis and FFA may prevent further progression of a patient's disease, leading to an improvement in their quality of life.

**Keywords:** contact allergen, contact dermatitis, frontal fibrosing alopecia, lichen planopilaris, personal care products

## Introduction

Frontal fibrosing alopecia (FFA) is a cicatricial alopecia affecting the frontal-temporal hairline, predominantly in postmenopausal women.<sup>1</sup> Classically, alopecia of the eyebrows has been reported in up to 80% of patients with FFA.<sup>1,2</sup> FFA is considered by some to be a variant of the scarring alopecia, lichen planopilaris, due in part to the overlap of the histopathologic findings; however, the clinical presentations of these entities can be quite distinct.<sup>2</sup> The incidence of FFA has risen in the last decade, with proposed hypotheses involving immunopathogenesis as well as several identified potential triggers, including hormonal influences, genetics, skin care products, and environmental factors.<sup>3</sup> Recent studies have causally implicated skin care agents, such as sunscreen and moisturizer, as potentially playing a role in FFA, while the role of hair care products remains less explored.<sup>3</sup> However,

it is unknown whether allergies develop as a result of skin-care products and then are exacerbated by interventions with hair regrowth agents. These products might crossreact and

### What is known about this subject in regard to women and their families?

- Frontal fibrosing alopecia (FFA) predominately affects women. The condition can lead to hair loss along the frontal-temporal hairline and eyebrows, which can have a significant impact on a woman's self-esteem and overall well-being.
- FFA has been associated with various potential triggers, including hormonal influences, genetics, over-the-counter (OTC) skin and hair products, and environmental factors.

### What is new from this article as messages for women and their families?

- This article presents new research findings that suggest a potential link between contact allergens in OTC hair products commonly used for hair regrowth and the development or exacerbation of FFA. This information is important for women and their families because it raises awareness about the potential impact of hair products on FFA.
- Women and their families should exercise caution when selecting OTC hair loss products. Some of these products may contain allergens that could worsen FFA symptoms, potentially leading to disease exacerbation.
- Understanding the potential role of contact allergens in the FFA and taking steps to avoid relevant allergens may improve the quality of life for women with FFA.

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share common ingredients that are potentially causal. Many prescription-strength and over-the-counter (OTC) hair products aimed at improving hair loss contain known allergens, which may have the potential to worsen alopecia symptoms and disease activity.

## Methods

A Google Boolean Search was conducted using the following: “list AND Hair AND loss AND growth AND serums OR solution.” Out of the 255,000,000 results generated online, the top-most nonsponsored search engine result page was utilized in our analysis. We focused on the top 10 nonsponsored results, which were online articles and magazines that received the most visibility and clicks.<sup>4–13</sup> We then reviewed the products listed in each of the 10 articles and excluded products advertised as shampoo and/or conditioners, intended for male use only, or eyebrow use only. The remaining 58 products were included in the analysis, all of which were unisex/female-indicated serums or solutions for scalp use only. A count of how many times each product showed up within those 10 articles was noted. From there, the active and inactive ingredients were individually noted for each product based on their website's ingredient list description. As a general note, any fragrance mixes were further analyzed, and the specific compounds were identified as allergens in this paper. After compiling a list of all the ingredients, a list of all potential contact allergens was produced using existing sources and information about contact allergens.<sup>14–16</sup> If multiple OTC products had similar contact allergens, they were grouped and made into a list.

## Results

Table 1 summarizes a list of common OTC products, categorized based on the specific contact allergens they contain. The table is first categorized by contact allergens and then organized in a hierarchical manner, listing contact allergens in descending order of frequency. Then for each contact allergen of interest, the OTC products containing that allergen were listed. The OTC products were also organized in a hierarchical manner for each contact allergen, listing products in descending order of times referenced in the online articles. A tally of how many times the OTC product was referenced in the online articles is listed in the far-right column of the table. For example, if a product was referenced a total of 3 times out of the 10 analyzed articles, a tally of 3 was made in the right column of Table 1, which would indicate that 30% of our sampled online articles/magazines contained that specific product. Therefore, it can be inferred that a patient is more likely to locate and purchase the product that is referenced more frequently (eg, 3 times out of 10 articles) compared to a product with a tally of one. The far-right column with tallies implies a correlation between higher numbers and increased product sales. Additionally, at the end of the table, the few anti-hair loss products that did not contain any of the allergens under investigation were grouped.

The following contact allergens were assessed: phenoxyethanol, sodium benzoate, panthenol, limonene, linalool, oil/extract of rosemary, eugenol, oil/extract of orange/citrus, tocopheryl acetate, zinc chloride, peppermint oil, oil/extract of lavender, menthol, oil/extract of lemon, oil of eucalyptus, oil of rose, tea tree essential oil, vanillin, ethylhexyl methoxycinnamate, menthoxypropanediol, oil/extract of lemongrass, oak moss, sorbic acid, isoeugenol, isopropyl myristate, methylisothiazolinone, cocamidopropyl betaine, organic jasmine oil, and zinc sulfate. Among the 58 OTC hair loss products analyzed, phenoxyethanol stood out as the most observed allergen of interest, being found in 19 products. Furthermore, a total of 13 products were found to have no contact allergens of interest, most of which were minoxidil containing products.

**Table 1**

### Common contact allergens in over-the-counter (OTC) hair products

Contact allergen	Product name	Times referenced online
Phenoxyethanol	Act + Acre Cold Processed Stem Cell Serum	6
	The Ordinary Multi-Peptide Serum for Hair Density	5
	Aveda Botanical Repair Strengthening Overnight Serum	3
	Ouai Scalp Serum	3
	The INKEY List Caffeine Stimulating Scalp Treatment	3
	dpHUE ACV Daily Scalp Serum	2
	Davines Energizing Thickening Tonic	1
	BOLDIFY Hair Growth/Thickening Serum	1
	Shapiro MD Hair Serum	1
	Actsyl Hair Growth Serum	1
	Better Not Younger Superpower+ Advanced Hair Densifying Scalp Serum	1
	Alfaparf Semi Di Lino Scalp Renew Energizing Lotion	1
	Revela Hair Revival Serum	1
	Rene Furterer Triphasic Reactional Concentrated Serum	1
	Pronexa Topical Hair Loss Serum	1
	BosleyMD Follicle Energizer	1
	Monpure Follicle Boost Hair Density Serum	1
	Fable & Mane HoliRoots Hair Oil	1
	Curlsmith Scalp Stimulating Booster	1
	Vegamour GRO Hair Serum for Thinning Hair	8
	Nutrafol Growth Activator	5
	The Ordinary Multi-Peptide Serum for Hair Density	5
	Ouai Scalp Serum	3
	Dr. Barbara Sturm Anti-Hair Fall Scalp Serum	2
	Shapiro MD Hair Serum	1
	Stripes Ectoine Calming & Thickening Scalp Serum	1
	Monat Hair Thinning Defense	1
	Inala Power Potion	1
	Alfaparf Semi Di Lino Scalp Renew Energizing Lotion	1
	Rene Furterer Triphasic Reactional Concentrated Serum	1
	Pronexa Topical Hair Loss Serum	1
	BosleyMD Follicle Energizer	1
	Curlsmith Scalp Stimulating Booster	1
	KLORANE Strengthening Serum with Quinine and Organic Edelweiss for Thinning Hair	1
	Vegnclever Hair Growth Serum	1
	Rene Furterer Triphasic Reactional Concentrated Serum	1
Sodium benzoate	Vegamour GRO Hair Serum for Thinning Hair	8
	Nutrafol Growth Activator	5
	The INKEY List Caffeine Stimulating Scalp Treatment	3
	Nécessaire The Scalp Serum	2
	Dr. Barbara Sturm Anti-Hair Fall Scalp Serum	2
	Davines Energizing Thickening Tonic	1
	Stripes Ectoine Calming & Thickening Scalp Serum	1
	Alfaparf Semi Di Lino Scalp Renew Energizing Lotion	1
	Rene Furterer Triphasic Reactional Concentrated Serum	1
	BosleyMD Follicle Energizer	1
	Monpure Follicle Boost Hair Density Serum	1
	KLORANE Strengthening Serum with Quinine and Organic Edelweiss for Thinning Hair	1
	BOLDIFY Hair Growth/Thickening Serum	1
	Vegnclever Hair Growth Serum	1
	Actsyl Hair Growth Serum	1
	Rahua Founder's Blend Scalp Treatment	1
Panthenol	Vegamour GRO Hair Serum for Thinning Hair	8
	Nutrafol Growth Activator	5
	The INKEY List Caffeine Stimulating Scalp Treatment	3
	Nécessaire The Scalp Serum	2
	Dr. Barbara Sturm Anti-Hair Fall Scalp Serum	2
	Davines Energizing Thickening Tonic	1
	Stripes Ectoine Calming & Thickening Scalp Serum	1
	Alfaparf Semi Di Lino Scalp Renew Energizing Lotion	1
	Rene Furterer Triphasic Reactional Concentrated Serum	1
	BosleyMD Follicle Energizer	1

(Continued)

**Table 1**  
(Continued)

Contact allergen	Product name	Times referenced online
Limonene	Vegamour GRO Hair Serum for Thinning Hair	8
	Aveda Botanical Repair Strengthening Overnight Serum	3
	Ouai Scalp Serum	3
	Kiehl's Magic Elixir Scalp and Hair Oil Treatment	2
	Davines Energizing Thickening Tonic	1
	Better Not Younger Superpower+ Advanced Hair Densifying Scalp Serum	1
	Rene Furterer Triphasic Reactional Concentrated Serum	1
	BosleyMD Follicle Energizer	1
	Monpure Follicle Boost Hair Density Serum	1
	Kérastase Genesis Serum Anti-Chute Fortifiant	1
	Curlsmith Scalp Stimulating Booster	1
	Weleda Revitalising Hair Tonic	1
	KLORANE Strengthening Serum with Quinine and Organic Edelweiss for Thinning Hair	1
	Vegnclever Hair Growth Serum	1
Linalool	Vegamour GRO Hair Serum for Thinning Hair	8
	Kiehl's Magic Elixir Scalp and Hair Oil Treatment	2
	Aveda Botanical Repair Strengthening Overnight Serum	3
	Ouai Scalp Serum	3
	Davines Energizing Thickening Tonic	1
	BosleyMD Follicle Energizer	1
	Monpure Follicle Boost Hair Density Serum	1
	Kérastase Genesis Serum Anti-Chute Fortifiant	1
	Fable & Mane HoliRoots Hair Oil	1
	Curlsmith Scalp Stimulating Booster	1
	Weleda Revitalising Hair Tonic	1
	Vegnclever Hair Growth Serum	1
	Pura D'or Hair Thinning Therapy Energizing Scalp Serum	3
	Hair Thickness Maximizer Hair Serum	2
Oil/extract of rosemary	Kiehl's Magic Elixir Scalp and Hair Oil Treatment	2
	Innersense Organic Beauty Natural Harmonic Treatment Oil	1
	Beneath Your Mask Nourish Skin & Hair Serum	1
	Better Not Younger Superpower+ Advanced Hair Densifying Scalp Serum	1
	Weleda Revitalising Hair Tonic	1
	BOLDIFY Hair Growth/Thickening Serum	1
	Rahua Founder's Blend Scalp Treatment	1
	ProBliva Hair Growth Serum	1
	Dr. Berg's (All In One) Hair Growth Serum	1
	Monpure Follicle Boost Hair Density Serum	1
	Vegamour GRO Hair Serum for Thinning Hair	8
	Aveda Botanical Repair Strengthening Overnight Serum	3
	Ouai Scalp Serum	3
	dphUE ACV Daily Scalp Serum	2
Eugenol	Nécessaire The Scalp Serum	2
	Davines Energizing Thickening Tonic	1
	Dr. Berg's (All In One) Hair Growth Serum	1
	Monat Hair Thinning Defense	1
	Agent Nateur Holi(locks) Strengthening Hair Growth Serum	1
	BOLDIFY Hair Growth Serum	1
	Vegnclever Hair Growth Serum	1
	Dr. Berg's (All In One) Hair Growth Serum	1
	Vegamour GRO Hair Serum for Thinning Hair	8
	Aveda Botanical Repair Strengthening Overnight Serum	3
	Innersense Organic Beauty Natural Harmonic Treatment Oil	1

(Continued)

**Table 1**  
(Continued)

Contact allergen	Product name	Times referenced online
Tocopheryl acetate	Agent Nateur Holi(locks) Strengthening Hair Growth Serum	1
	Better Not Younger Superpower+ Advanced Hair Densifying Scalp Serum	1
	Oway Densifying Remedy	1
	Rene Furterer Triphasic Reactional Concentrated Serum	1
	Better Roots RootBoost Serum	1
	BOLDIFY Hair Growth Serum	1
	Vegnclever Hair Growth Serum	1
	Ouai Scalp Serum	3
	Aveda Botanical Repair Strengthening Overnight Serum	3
	Shapiro MD Hair Serum	1
	Better Not Younger Superpower+ Advanced Hair Densifying Scalp Serum	1
	Monpure Follicle Boost Hair Density Serum	1
	BOLDIFY Hair Growth/Thickening Serum	1
	Stripes Ectoine Calming & Thickening Scalp Serum	1
Zinc chloride	Nutrafol Growth Activator	5
	The Ordinary Multi-Peptide Serum for Hair Density	5
	The INKEY List Caffeine Stimulating Scalp Treatment	3
	Pura D'or Hair Thinning Therapy Energizing Scalp Serum	3
	Dr. Barbara Sturm Anti-Hair Fall Scalp Serum	2
	Agent Nateur Holi(locks) Strengthening Hair Growth Serum	1
	Actsyl Hair Growth Serum	1
	Hair Thickness Maximizer Hair Serum	2
	Oway Densifying Remedy	1
	BOLDIFY Hair Growth/Thickening Serum	1
	Rahua Founder's Blend Scalp Treatment	1
	Wild Growth Hair Oil	1
	Beneath Your Mask Nourish Skin & Hair Serum	1
	dphUE ACV Daily Scalp Serum	2
Peppermint oil	Beneath Your Mask Nourish Skin & Hair Serum	1
	Wild Growth Hair Oil	1
	Dr. Berg's (All In One) Hair Growth Serum	1
	Nuele Nighttime Scalp Serum	1
	Davines Energizing Thickening Tonic	1
	Oway Densifying Remedy	1
	Alfaparf Semi Di Lino Scalp Renew Energizing Lotion	1
	KLORANE Strengthening Serum with Quinine and Organic Edelweiss for Thinning Hair	1
	Actsyl Hair Growth Serum	1
	Innersense Organic Beauty Natural Harmonic Treatment Oil	1
	Nuele Nighttime Scalp Serum	1
	Rene Furterer Triphasic Reactional Concentrated Serum	1
	BOLDIFY Hair Growth Serum	1
	Davines Energizing Thickening Tonic	1
Oil/Extract of lemon	Wild Growth Hair Oil	1
	Rene Furterer Triphasic Reactional Concentrated Serum	1
	Beneath Your Mask Nourish Skin & Hair Serum	1
	Wild Growth Hair Oil	1
	Reverie CAKE Restorative Scalp Tonic	1
	Reverie CAKE Restorative Scalp Tonic	1
	Agent Nateur Holi(locks) Strengthening Hair Growth Serum	1
	Rahua Founder's Blend Scalp Treatment	1
Oil of eucalyptus	Beneath Your Mask Nourish Skin & Hair Serum	1
	Wild Growth Hair Oil	1
	Reverie CAKE Restorative Scalp Tonic	1
	Reverie CAKE Restorative Scalp Tonic	1
	Agent Nateur Holi(locks) Strengthening Hair Growth Serum	1
	Rahua Founder's Blend Scalp Treatment	1
Oil of rose	Beneath Your Mask Nourish Skin & Hair Serum	1
	Wild Growth Hair Oil	1
	Reverie CAKE Restorative Scalp Tonic	1
	Reverie CAKE Restorative Scalp Tonic	1
	Agent Nateur Holi(locks) Strengthening Hair Growth Serum	1
	Rahua Founder's Blend Scalp Treatment	1
Vanillin	Beneath Your Mask Nourish Skin & Hair Serum	1
	Wild Growth Hair Oil	1
	Reverie CAKE Restorative Scalp Tonic	1
	Reverie CAKE Restorative Scalp Tonic	1
	Agent Nateur Holi(locks) Strengthening Hair Growth Serum	1
	Rahua Founder's Blend Scalp Treatment	1

(Continued)

**Table 1**  
(Continued)

Contact allergen	Product name	Times referenced online
Ethylhexyl methoxycinnamate	Shapiro MD Hair Serum	1
	Alfaparf Semi Di Lino Scalp Renew Energizing Lotion	1
Menthoxypropanediol	Kérastase Genesis Serum Anti-Chute Fortifiant	1
	BOLDIFY Hair Growth/Thickening Serum	1
Oil/extract of lemongrass	Pura D'or Hair Thinning Therapy Energizing Scalp Serum	3
	Beneath Your Mask Nourish Skin & Hair Serum	1
Oak moss	Act + Acre Cold Processed Stem Cell Serum	6
Sorbic acid	dpHUE ACV Daily Scalp Serum	2
Isoeugenol	Fable & Mane HoliRoots Hair Oil	1
Isopropyl myristate	Kiehl's Magic Elixir Scalp and Hair Oil Treatment	2
Methylisothiazolinone	BOLDIFY Hair Growth/Thickening Serum	1
Cocamidopropyl betaine	Shapiro MD Hair Serum	1
Organic jasmine oil	RANAVAT Fortifying Hair Serum	1
Zinc sulfate	Aveda Botanical Repair Strengthening Overnight Serum	3
No identified contact allergens of interest	Women's Rogaine 5% Minoxidil Foam or 2% Minoxidil Topical Solution	4
	Briogeo B. Well organic + cold-pressed 100% castor oil	2
	Nioxin Hair Regrowth Treatment for Women	2
	hers Hair Regrowth Treatment	2
	OPO Watercress Seed Oil	1
	Michele Green Hair Revitalizing Serum for Women	1
	Virtue Hair Growth Treatment 1 Month Kit	1
	Groh Stimulating Scalp Serum	1
	TOMUM 5% Minoxidil Foam for Men and Women	1
	Lilivera 5% Minoxidil Spray	1
	Liaison Hair Bond	1
	Keeps Treatment Plan	1
	Keranique Hair Regrowth Treatment	1

## Discussion

There is conflicting evidence as to whether contact allergens may play a role in the underlying etiology or the progression of FFA. A recent small prospective study compared 20 patients with FFA to 24 age and sex-matched controls. The results showed that among the cohort of patients with FFA, one or more patch test allergens were identified in 65% versus 37.5% of the control group ( $P = .003$ ).<sup>17</sup> Another study discovered that propolis and iodopropynyl butylcarbamate were the most typical allergens in FFA.<sup>18</sup> Additionally, a recent study patch-tested 42 patients with FFA/LLP and showed that among the patients with positive patch test results, avoidance of the allergen identified resulted in decreased scalp erythema in 70% of those patients.<sup>19</sup> Research suggests an association between contact allergens and alopecia, however, the exact pathogenesis of their relationship is not yet fully understood.

Our analysis has certain limitations. Firstly, it lacks broader inclusion criteria that would cover hair treatments specifically designed for men or those targeting eyebrows. Additionally, our analysis would be stronger if we expanded our search to include a greater number of online articles and magazines in addition to expanding our inclusion criteria to encompass shampoos and conditioners. It is also important to note that the active and inactive ingredient lists were sourced from the websites themselves, potentially introducing bias through the selective promotion of certain ingredients by the companies. This selectively could make it more challenging to identify specific ingredients and may have caused some inconsistencies within our data. Furthermore, it is also possible that certain allergens were overlooked because there weren't

enough sources with comprehensive contact allergen lists in the literature.

Although more research and larger cohorts are needed to further elucidate the relationship between FFA and contact allergens, the authors feel it is important to highlight the issues related to the treatment of the disease and potential exposure to contact allergens in treatment. Many patients frequently turn to OTC products in search of treatment to stop the progression of their alopecia based on the most common articles and magazines they see online. Many of the OTC products used by patients contain potential contact allergens and thus could, in the long-term, lead to the exacerbation of FFA/lichen planopilaris for which the patients are seeking treatment. Although potential sources of contact allergens in products were examined, it does not automatically guarantee that an individual will present with a contact allergy to that ingredient. Patch testing the patients on an individual basis is needed to confirm the presence of contact allergies. It is also to be noted that patients with pigmented purpuric dermatosis contact allergy do not develop scarring alopecia.<sup>1,17,18</sup> Therefore, insufficient data exists to establish contact allergens as a cause of FFA. It may aggravate preexisting FFA, although no concrete evidence of this claim exists based on the current studies.

The exogenous substances listed in Table 1 can be found in many skincare, cosmetics, and hair care products. Patients seeking to improve their FFA symptoms with OTC products containing these contact allergens could have the potential to worsen their disease activity. Avoiding relevant allergens on the scalp and face may reduce local inflammation in some patients with alopecia, suggesting disease improvement.<sup>19</sup> Furthermore, patients with FFA should undergo patch testing to identify any contact allergens they are allergic to so they are mindful of which products to avoid.<sup>19</sup> Further study of this concept is needed to continue to explore and define the association between common contact allergens and the role they may play in FFA. Research into the role of the allergic/immunologic etiology in alopecia development could have a positive impact on the quality of life of patients with FFA.

## Conclusion

This study demonstrated the need for further investigation into the etiopathogenesis of FFA. Providers should be aware of the potential association between contact allergens found in OTC products they find through online search engines and disease activity in patients with FFA. Providers and patients should be cautious of OTC hair loss products containing the relevant allergens discussed. Avoidance of relevant allergens on the scalp may halt or even improve disease progression and symptoms. This study is limited by the nature of product review and the limited availability of current research on the topic. Future studies may be of interest to elucidate the relationship between FFA and contact dermatitis resulting from OTC products.

## Conflicts of interest

None.

## Funding

None.

## Study approval

N/A

## Author contributions

KKV, BF, MP, and MT: Contributed equally to this work.



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