

Allergen Content of Best-Selling Ethnic Versus Nonethnic Shampoos, Conditioners, and Styling Products

Melanie Tawfik, MD,* Larissa G. Rodriguez-Homs, MBS,† Tiffany Alexander, MD,‡ Stavonnie Patterson, MD,§ GINETTE Okoye, MD,|| and Amber Reck Atwater, MD‡

Background: Hair products are a potential cause of allergic contact dermatitis. There are limited data on the allergen content of ethnic hair products.

Objective: To identify allergens unique to ethnic hair products (shampoos, conditioners, styling products) and provide a resource for low allergen hair care products for patients with ethnic hair types.

Methods: The top 100 best-selling shampoos, conditioners, and styling products for ethnic and nonethnic hair products were determined from 3 major online retailers (Walmart, Target, Walgreens). Allergen was defined as presence on the 2017 American Contact Dermatitis Society Core 80 allergen list.

Results: The 2017 American Contact Dermatitis Society Core 80 allergens were tabulated for ethnic and nonethnic shampoos, conditioners, and styling products. A list of low-allergen shampoos, conditioners, and styling products was identified. Fragrance was the most common allergen for ethnic shampoos, conditioners, and styling products. Other notable allergens included methylchloroisothiazolinone/methylisothiazolinone, formaldehyde releasers, cetyl steryl alcohol, tocopherol, decyl glucoside, sodium benzoate, and phenoxyethanol.

Conclusions: This study identifies important differences in allergens found in products marketed for ethnic hair compared with those marketed for nonethnic hair.

Allergic contact dermatitis (ACD) to cosmetic products is reported worldwide,¹⁻³ with hair care products being a major culprit. Shampoos, conditioners, and hairstyling products, which are frequently in contact with the scalp, are significant sources of ACD.⁴ The number of ingredients in each product can range from only one to as many as 50. Ingredients can include surfactants, conditioners, fragrances, preservatives, active ingredients, and other chemicals.

Fragrance has been reported as the most common allergen in shampoos, conditioners, and styling products.^{3,5} Finding alternative products free of specific allergens is crucial in obtaining clinical improvement in patients with contact allergy. Although studies have evaluated the common allergens present in hair care products, there

are limited data on the allergen content of hair products marketed for individuals with ethnic hair types.

In the field of cosmetics, there is a market for products targeting individuals with ethnic hair. Studies have shown that exposure to chemicals in hair products may differ by race and/or ethnicity. James-Todd et al⁶ found that African American and African Caribbean women use more hair products when compared with other groups. The purpose of this article is to review the unique allergens present in best-selling adult ethnic hair shampoos, conditioners, and styling products. In addition, we compared this to allergens in nonethnic best-selling adult shampoos, conditioners, and styling products. Finally, we generated a list of low-allergen ethnic hair products.

From the *Department of Dermatology, Loma Linda University Medical Center, CA; †Duke University School of Medicine; and ‡Department of Dermatology, Duke University Medical Center, Durham, NC; §Northwest Community Healthcare, Arlington Heights, IL; ||Department of Dermatology, Howard University, Washington, DC.

Address reprint requests to Amber Reck Atwater, MD, Department of Dermatology, Duke University Medical Center, 5324 McFarland Dr #210, Durham, NC 27707. E-mail: amber.atwater@duke.edu.

A.R.A. received a Pfizer Independent Grant for Learning and Change. The other authors have no funding or conflicts of interest to declare.

DOI: 10.1097/DER.0000000000000668

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METHODS

On October 15, 2018, the top 100 best-selling ethnic shampoos, conditioners, and styling products for adults were separately determined from 3 major online retailers (Walmart, Target, and Walgreens). Within each retailer's hair care category, a subcategory of natural hair care, ethnic hair care, or a retailer specific equivalent was selected. Next, the following retailer-supplied preexisting filters were applied: "shampoo," "conditioner," and "styling products." Similarly, on December 17, 2018, the top 100 best-selling nonethnic shampoos, conditioners, and styling products were determined from the same

3 major online retailers (Walmart, Target, and Walgreens). The following retailer preexisting filters were applied: “shampoo,” “conditioner,” and “styling products.” The goal was to review up to 300 ethnic hair care products from each category (3 retailers × up to 100 products each) and up to 300 nonethnic hair care products from each category (3 retailers × up to 100 products each), with final numbers dependent on the number of products identified in each category and amount of duplicates between databases.

Ingredient lists were obtained from the retailer’s website, and a photograph of the product label was found online to confirm ingredients. Products that were inappropriately listed as hair products under the category of shampoos, conditioners, or styling products were excluded. Duplicate products were also excluded.

Ingredients were reviewed, and allergens were identified. For the purposes of this study, allergen was defined as a chemical present on the 2017 American Contact Dermatitis Society (ACDS) Core 80 test series.⁷ The number of allergens in each product was tabulated. Ingredients known to cross-react with ACDS Core allergens were counted as that allergen. Cross-reactors were determined using the ACDS Contact Allergen Management Program database cross-reactors list.

We created a list of the most common ACDS Core allergens found in each category of shampoo, conditioner, and styling product for ethnic and nonethnic hair care products.

RESULTS

A total of 262 ethnic hair products and 486 nonethnic hair products were included in this study.

Ethnic Hair Care Products

Shampoos

Thirty-six unique ethnic hair shampoos were identified. The mean number of allergens present was 4.8. The range of ACDS Core 80 allergens in a product was 2 to 11. The most common allergen was fragrance (97.2%) followed by cocamidopropyl betaine (CAPB) (72.2%) (Table 1). The third and fourth most common allergens were decyl glucoside (44.4%) and tocopherol (38.9%), respectively. The fifth most common allergen was sodium benzoate (33.3%). A list of low-allergen ethnic shampoos can be found in Table 2. One shampoo, “The Seaweed Bath Co. Moisturizing Unscented Shampoo” was the only shampoo identified to be fragrance-free.

Conditioners

Thirty-two unique ethnic hair conditioners were identified. The mean number of allergens present was 4.9. The range of ACDS Core 80 allergens in a product was 3 to 8. The most common allergen was fragrance (96.9%) followed by cetyl steryl alcohol (81.3%) (Table 1). The third and fourth most common allergens were tocopherol (46.9%) and phenoxyethanol (31.3%). The fifth most common allergen was Compositae mix (28.1%) (Table 1). A list of low-allergen ethnic conditioners can be found in Table 2. The only fragrance-free conditioner was “The Seaweed Bath Co. Natural Moisturizing Conditioner.”

Styling Products

One hundred ninety-four unique ethnic hairstyling products were identified. The mean number of allergens was 4. The range of ACDS Core 80 allergens in a product was 0 to 9. The most common allergen was fragrance (95.9%) followed by tocopherol (44.3%). The third and fourth most common allergens were phenoxyethanol (40.7%) and cetyl steryl alcohol (37.6%). The fifth most common allergen was Compositae mix (21.1%) (Table 1). Eight styling products were free of fragrance. A list of low-allergen ethnic styling products can be found in Table 2.

Nonethnic Hair Care Products

Shampoos

One hundred fifty nonethnic hair shampoos were identified. The mean number of allergens present in nonethnic shampoos was 5.2. The range of ACDS Core 80 allergens in a product was 1 to 14. The most common allergen was fragrance (96.7%) followed by CAPB (82.7%) (Table 1). The third and fourth most common allergens were methylchloroisothiazolinone/methylisothiazolinone (MCI/MI) (57.3%) and sodium benzoate (50.0%). The fifth most common allergen was formaldehyde releasers (FRs) (36.3%).

Conditioners

One hundred forty-two nonethnic hair conditioners were identified. The mean number of allergens present in nonethnic conditioners was 5.9. The range of ACDS Core 80 allergens in a product was 1 to 11. The most common allergens were fragrance and cetyl steryl alcohol, which were found at the same frequency (98.6%) (Table 1). The third and fourth most common allergens were MCI/MI (53.5%) and amidoamine (41.5%). The fifth most common allergen was benzalkonium chloride (40.8%).

Styling Products

One hundred ninety-four nonethnic hairstyling products were identified. The mean number of allergens was 3.0. The range of ACDS Core 80 allergens in a product was 0 to 8. The most common allergen was fragrance (94.8%), followed by propylene glycol (26.8%) (Table 1). The third and fourth most common allergens were the FRs (23.2%) and phenoxyethanol (18%). The fifth most common allergen was tocopherol (16%).

DISCUSSION

Studies on allergen content of ethnic or natural hair care products and the broader topic of contact allergy in skin-of-color patients are lacking. The goal of this study was to identify allergens present in and unique to ethnic or natural hair products (shampoos, conditioners, styling products) and provide a resource for low-allergen hair care products that could be utilized by patients with ethnic or natural hair types. We will also describe current knowledge on contact allergy in patients with skin of color and discuss hair characteristics and hair product preferences in skin-of-color patients.

TABLE 1. ACDS Core Allergens in Ethnic and Nonethnic Hair Products

Ethnic Conditioners, n = 32	Ethnic Allergens	No. Products	Percent of Products	Nonethnic Conditioners, n = 142	Nonethnic Allergens	No. Products	Percent of Products
	Fragrance	35	97.2		Fragrance	145	96.7
	CAPB	26	72.2		CAPB	124	82.7
	Decyl glucoside	16	44.4		MCI/MI	86	57.3
	Tocopherol	14	38.9		Sodium benzoate	75	50.0
	Sodium benzoate	12	33.3		FRs	56	36.3
	FRs	11	30.6		Tocopherol	43	28.7
	Phenoxyethanol	9	25.0		Propylene glycol	43	28.7
	Propylene glycol	8	22.2		Phenoxyethanol	22	14.7
	Compositae mix	5	13.9		Benzyl alcohol	22	14.7
	Iodopropynyl butylcarbamate	5	13.9		Benzalkonium chloride	21	14.0
	Paraben mix	5	13.9		Iodopropynyl butylcarbamate	20	13.3
	Benzyl alcohol	4	11.1		Cetyl steryl alcohol	18	12.0
	Benzalkonium chloride	3	8.3		Decyl glucoside	17	11.3
	Benzophenone-4	3	8.3		Compositae mix	17	11.3
	Ethylhexylglycerin	3	8.3		Benzophenone-4	10	6.7
	MCI/MI	3	8.3		2-Ethylhexyl-4-methoxycinnamate	9	6.0
	Benzoic acid	2	5.6		Tea tree oil	8	5.3
	BHT	2	5.6		Benzoic acid	7	4.7
	Cetyl steryl alcohol	2	5.6		Paraben mix	6	4.0
	Methylisothiazolinone	1	2.8		Lavender absolute	5	3.3
	Cocamide DEA	1	2.8		Sorbic acid	5	3.3
	Lavender absolute	1	2.8		Methylisothiazolinone	4	2.7
	Propolis	1	2.8		BHT	2	1.3
	Sorbic acid	1	2.8		Cocamide DEA	2	1.3
	Tea tree oil	1	2.8		Propolis	2	1.3
					Sorbitan Sesquioleate	1	0.7
					DMAPA	1	0.7
					Ethylhexylglycerin	1	0.7

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TABLE 1. (Continued)

Ethnic Conditioners, n = 32		Nonethnic Conditioners, n = 142		Percent of Products		Percent of Products	
Ethnic Allergens	No. Products	Ethnic Allergens	No. Products	Percent of Products	No. Products	Nonethnic Allergens	No. Products
Fragrance	31	Fragrance	140	96.9	140	Fragrance	140
Cetyl steryl alcohol	26	Cetyl steryl alcohol	140	81.3	140	Cetyl steryl alcohol	140
Tocopherol	15	MCI/MI	76	46.9	76	MCI/MI	76
Phenoxyethanol	10	Amidoamine	59	31.3	59	Amidoamine	59
Compositae mix	9	Benzalkonium chloride	58	28.1	58	Benzalkonium chloride	58
Sodium benzoate	8	Benzyl alcohol	50	25.0	50	Benzyl alcohol	50
Amidoamine	7	FR	51	21.9	51	FR	51
Benzyl alcohol	6	Tocopherol	48	18.8	48	Tocopherol	48
Propylene glycol	6	Phenoxyethanol	42	18.8	42	Phenoxyethanol	42
Benzalkonium chloride	5	Propylene glycol	39	15.6	39	Propylene glycol	39
FRs	5	Compositae mix	19	15.6	19	Compositae mix	19
Ethylhexylglycerin	4	Chlorhexidine digluconate	16	12.5	16	Chlorhexidine digluconate	16
Iodopropynyl butylcarbamate	4	Iodopropynyl butylcarbamate	15	12.5	15	Iodopropynyl butylcarbamate	15
MCI/MI	4	Benzoic acid	14	12.5	14	Benzoic acid	14
Benzoic acid	3	2-Ethylhexyl-4-methoxycinnamate	13	9.4	13	2-Ethylhexyl-4-methoxycinnamate	13
Chlorhexidine digluconate	2	BHT	10	6.3	10	BHT	10
CAPB	2	Sodium benzoate	7	6.3	7	Sodium benzoate	7
Lavender absolute	2	Benzophenone-4	7	6.3	7	Benzophenone-4	7
Paraben mix	2	Paraben mix	6	6.3	6	Paraben mix	6
DMAPA	1	Lavender absolute	4	3.1	4	Lavender absolute	4
Propolis	1	CAPB	3	3.1	3	CAPB	3
Sorbitan sesquioleate	1	Propolis	3	3.1	3	Propolis	3
		Ethylhexylglycerin	2		2	Ethylhexylglycerin	2
		Tea tree oil	2		2	Tea tree oil	2
		Decyl glucoside	2		2	Decyl glucoside	2
		Benzophenone-3	1		1	Benzophenone-3	1
		Methylisothiazolinone	1		1	Methylisothiazolinone	1
		Lanolin alcohol	1		1	Lanolin alcohol	1
		Sorbitan sesquioleate	1		1	Sorbitan sesquioleate	1

Ethnic styling products, n = 194	186	95.9	Nonethnic styling products, n = 194	184	94.8
Fragrance			Fragrance		
Tocopherol	86	44.3	Propylene glycol	52	26.8
Phenoxyethanol	79	40.7	FRs	45	23.2
Cetyl steryl alcohol	73	37.6	Phenoxyethanol	35	18.0
Compositae mix	41	21.1	Tocopherol	31	16.0
Propylene glycol	31	16.0	Benzyl alcohol	28	14.4
Benzaikonium chloride	29	14.9	Benzaikonium chloride	26	13.3
Ethylhexylglycerin	28	14.4	Paraben mix	23	11.9
Propolis	24	12.4	Ethylhexyl methoxycinnamate	22	11.3
Benzyl alcohol	23	11.9	Cetyl steryl alcohol	18	9.3
Lanolin alcohol	22	11.3	Ethylhexylglycerin	17	8.7
FRs	19	9.8	Benzophenone-4	16	8.2
Sodium benzoate	19	9.8	Sodium benzoate	14	7.2
Tea tree oil	16	8.2	CAPB	10	5.2
Paraben mix	14	7.2	Iodopropynyl butylcarbamate	10	5.2
Sorbitan sesquioleate	12	6.2	Lanolin alcohol	9	4.6
Methylisothiazolinone	11	5.7	Compositae mix	7	3.6
CAPB	9	4.6	Propolis	6	3.1
Lavender absolute	9	4.6	BHT	6	3.1
Sorbic acid	9	4.6	MCI/MI	4	2.1
BHT	8	4.1	Amidoamine	4	2.1
Iodopropynyl butylcarbamate	7	3.6	Sorbic acid	3	1.5
Benzophenone-4	6	3.1	Tea tree oil	2	1.0
Amidoamine	4	2.1	Methylisothiazolinone	2	1.0
Chlorhexidine digluconate	3	1.5	DMAPA	1	0.7
Benzophenone-3	2	1.0	Ethylhexylglycerin	1	0.7
MCI/MI	2	1.0			
DMAPA	1	0.5			
Benzoic acid	1	0.5			
Decyl glucoside	1	0.5			

FRs include formaldehyde, DMDM hydantoin, diazolidinyl urea, imidazolidinyl urea, quaternium-15, and 2-bromo-2-nitropropane-1,3-diol.
Benzophenone-3, 2-hydroxy-4-methoxybenzophenone; benzophenone-4, 2-hydroxy-4-methoxybenzophenone-5-sulfonic acid; BHT, 2,6-di-tert-butyl-4-cresol; DMAPA, 3-(dimethylamino)propylamine.

TABLE 2. Low-Allergen and Fragrance-Free Ethnic Hair Shampoos, Conditioners, and Styling Products

Product	ACDS Core Allergens	No. Core Allergens
Shampoos		
1. As I am Curl Clarity Shampoo	CAPB	2
2. Mizani Thermasmooth Shampoo	Fragrance Paraben mix	3
3. SheaMoisture Coconut and Hibiscus Curl and Shine	Sodium benzoate Decyl glucoside Fragrance	3
4. SheaMoisture Jamaican Black Castor Oil Strengthen and Grow Shampoo	Tocopherol Decyl glucoside Fragrance	3
5. SheaMoisture Jamaican Black Castor Oil Strengthen and Restore Shampoo	Tocopherol Decyl glucoside Fragrance	3
6. SheaMoisture Manuka Honey and Mafura Oil Intensive Hydration Shampoo	Tocopherol Decyl glucoside Fragrance	3
7. SheaMoisture Raw Shea and Cupuacu Frizz Defense Shampoo	Tocopherol CAPB Fragrance	3
8. Beautiful Textures Tangle Taming Moisturizing Shampoo	Decyl glucoside CAPB FR Fragrance	4
9. Cantu Shea Butter Moisturizing Cream Shampoo	Tocopherol Benzophenone-4 CAPB Fragrance	4
10. Carol's Daughter Black Vanilla Sulfate-Free Shampoo	FR CAPB Fragrance	4
11. Not Your Mother's Tahitian Gardenia Flower and Mango Butter Curl Defining Shampoo	Lavender absolute Phenoxyethanol CAPB Ethylhexylglycerin Fragrance	4
12. Pacifica Coconut Power Strong and Long Moisturizing Shampoo	Phenoxyethanol Decyl glucoside Ethylhexylglycerin Fragrance	4
13. SheaMoisture Raw Shea Butter Moisture Retention Shampoo	Sodium benzoate Decyl glucoside Fragrance	4
14. SheaMoisture African Black Soap Deep Cleansing Shampoo	Sodium benzoate Tocopherol Decyl glucoside Fragrance	4
15. SheaMoisture Coconut and Hibiscus Curl and Shine Shampoo	Tea Tree Tocopherol Decyl glucoside Fragrance	4
16. SoftSheen-Carson Optimum Salon Collection Replenishing Shampoo	Sodium benzoate Tocopherol CAPB FR	4
17. The Seaweed Bath Co. Moisturizing Unscented Shampoo*	Fragrance Paraben mix CAPB Decyl glucoside Sodium benzoate Tocopherol	4
Conditioners		
1. SheaMoisture, Jamaican Black Castor Oil Strengthen Grow and Restore Conditioner	Cetyl steryl alcohol Fragrance Tocopherol	3
2. SheaMoisture Superfruit Complex 10-in-1 Renewal System Conditioner	Cetyl steryl alcohol Fragrance Tocopherol	3
3. Cantu Shea Butter Color Protecting Conditioner	Cetyl steryl alcohol Phenoxyethanol Stearamidopropyl dimethylamine Fragrance	4

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TABLE 2. (Continued)

Product	ACDS Core Allergens	No. Core Allergens
4. Cantu Shea Butter Moisturizing Rinse Out Conditioner	Cetyl steryl alcohol FR Fragrance	4
5. Carol's Daughter Almond Milk Restoring Conditioner	Stearamidopropyl dimethylamine Compositae mix Fragrance Sodium benzoate Tocopherol	4
6. Carol's Daughter Rhassoul Clay Softening Hair Mask	Benzyl alcohol Cetyl steryl alcohol Fragrance Sodium benzoate	4
7. Curls Coconut Curlada Conditioner	Cetyl steryl alcohol Compositae mix Fragrance Phenoxyethanol	4
8. Not Your Mother's Tahitian Gardenia Flower and Mango Butter Curl Defining Conditioner	CAPB Ethylhexylglycerin Fragrance Phenoxyethanol	4
9. Optimum Salon Haircare Amla Legend Moisture Remedy Conditioner	Benzyl alcohol Cetyl steryl alcohol Fragrance Sodium benzoate	4
10. Pantene Pro-V Gold Series Moisture Boost Conditioner	Benzyl alcohol Cetyl steryl alcohol Fragrance MCI/MI	4
11. SheaMoisture Coconut and Hibiscus Curl and Shine Conditioner	Cetyl steryl alcohol Fragrance Sorbitan sesquioleate Tocopherol	4
12. SheaMoisture Manuka Honey and Mafura Oil Intensive Hydration Conditioner	Cetyl steryl alcohol Fragrance Propolis Tocopherol	4
13. SheaMoisture Raw Shea Butter Restorative Conditioner	Cetyl steryl alcohol Fragrance Sodium benzoate Tocopherol	4
14. The Seaweed Bath Co. Natural Moisturizing Conditioner*	Benzalkonium chloride Cetyl steryl alcohol Sodium benzoate Tocopherol	4
Styling products		
1. Hollywood Beauty 100% Pure Coconut Oil*	N/A	0
2. SheaMoisture 100% Extra Virgin Coconut Oil*	N/A	0
3. SheaMoisture 100% Pure Argan Oil*	N/A	0
4. SheaMoisture 100% Pure Baobab Oil*	N/A	0
5. SheaMoisture 100% Pure Jamaican Black Castor Oil*	N/A	0
6. SheaMoisture 100% Pure Shea Oil*	N/A	0
7. Cantu Shea Butter Hair Dressing Pomade	Fragrance	1
8. Cantu Shea Butter Super Shine Hair Silk	Fragrance	1
9. Cantu Thermal Shield Heat Protectant	Fragrance	1
10. Crème of Nature 100% Pure Argan Oil	Fragrance	1
11. Jason Flaxseed Hi Shine Styling Gel	Fragrance	1
12. Maui Moisture Nourish & Moisture + Coconut Milk Weightless Oil Mist	Fragrance	1
13. Maui Moisture Heal & Hydrate + Shea Butter Raw Oil	Fragrance	1
14. Miss Jessie's Jelly Soft Curls Gel	Fragrance	1
15. Murray's Superior Hair Dresser Pomade	Fragrance	1
16. Pantene Pro-V Gold Series Intense Oil Treatment	Fragrance	1
17. Rasta Locks & Twists Jamaican Mango & Lime Locking Creme Hair Wax	Fragrance	1
18. Royal Crown Hair Dressing	Fragrance	1

*The product is fragrance-free.

Contact Allergy in Patients With Skin of Color

There are a limited number of studies that focus on contact allergy in skin-of-color patients. Yu et al⁸ analyzed 139 African American patients (2003–2012) and found that the most common allergens

were nickel, fragrance mix I, bacitracin, balsam of Peru (BOP), and paraphenylenediamine (PPD). Deleo et al⁹ examined race in 19,457 patch-tested patients (1998–2006); in Black patients (n = 1360), the most common allergens were nickel, neomycin, bacitracin, cobalt, PPD, fragrance mix I, BOP, quaternium-15, and

formaldehyde. Paraphenylenediamine; bacitracin; and the rubber accelerators thiuram mix, mercapto mix, and mercaptobenzothiazole were more likely to be positive in Black patients than White patients, and formaldehyde, quaternium-15, diazolidinyl urea, ethylene urea melamine formalin resin, fragrance mix I, and BOP were less likely to be positive in Black patients. The authors theorized that these differences were related to exposure patterns. Dickel et al¹⁰ compared patch test results for White and Black racial groups in 991 patients (1988–1991). The most common allergens among Black patients were nickel, PPD, quaternium-15, thiomersal, diaminodiphenyl methane, and benzocaine. There was a higher sensitization frequency for PPD for Black versus White patients and for imidazolidinyl urea for Black men as compared with White men.

In patients with skin of color, positive patch test reactions can vary clinically. Scaling, lichenification, and hyperpigmentation can be seen more frequently,^{8,10} and erythema may not be as readily identifiable. Thus, for those who lack experience or who are working with inadequate lighting, interpretation of patch test results may be more complex in patients with skin of color.

Hair Characteristics and Product Preferences in Skin-of-Color Patients

Generally speaking, most individuals buy hair products that are tailored to enhance their specific hair type. The shape of the hair follicle contributes to the variety of hair textures. In patients with a tight curl pattern, the dermal implantation of the hair follicle is more curved.¹¹ As a result, the hair is more fragile and susceptible to breakage. The curved hair also prevents the sebum produced at the base of the follicle from traveling down the length of the hair, making the moisture content quite low.¹¹ Hair care regimens embraced by skin-of-color patients with a curved hair follicle thus focus on the management of hair fragility and dryness.^{11,12} To provide proper moisture to the hair, multiple products may be used, which could increase the risk of sensitization and subsequent development of ACD.¹³ Stallings and Sood¹² provide a review of the common steps in the African American female hair care regimen. Broadly, the sequence can be broken down into 3 categories: cleansing, moisturizing, and processing, all of which could introduce potential allergens.

Both natural and chemically treated hair, in African American patients, respond best to high-moisture products. Sulfate-free shampoos, specifically, are popular in ethnic hair care.^{12,14} Sulfates and sulfate derivatives, such as sodium lauryl sulfate, sodium laureth sulfate, and ammonium laurel sulfate, remove oil from the hair, which dries out the hair.¹² In our study, 81% of ethnic shampoos were free of sulfates, reflecting the sulfate-free trend.

In terms of conditioning and styling, many skin-of-color patients consider products geared toward moisturizing.¹² Moisturizing conditioners include cationic surfactants and polymers.^{11,15} Cationic surfactants adhere to the hair surface, protecting the hair from damage and tangling.^{16–18} Cationic polymers bind to the hair shaft and seal the cuticle, which improves hair texture by reducing the friction between strands and increasing manageability, body, and firmness

of the hair.^{19–21} Cationic polymers are identified as polyquaterniums, polysaccharides, chitins, and cellulose derivatives including hydroxyethyl cellulose.^{15,21,22} Emollients (fats, ceramides, cetyl alcohol, lanolin), essential oils (coconut oil, rosemary oil, thyme oil), humectants (glycerin, glycerol), protein (collagen, keratin, elastin), and silicone are all ingredients that provide protective properties in ethnic hair care products.¹⁴ Many of these ingredients can be found on the ACDS Core allergen list.

It is important for dermatologists to be aware of the differences in the biochemical and structural qualities of tightly curled hair as it may influence patient hair care regimens and could affect the management and diagnosis of scalp- and hair-related concerns.¹² Dermatologists should be mindful of the products they are recommending to adequately tailor to patient hair care needs.

Hair Product Allergens

There was no significant difference in fragrance content between the ethnic and nonethnic shampoos (97.2%–96.7%), conditioners (96.9%–98.6%), or hairstyling products (95.9%–94.8%). In 2009, Zirwas and Moennich⁵ similarly noted the presence of fragrance in 95% of 179 analyzed shampoos from a US-based retailer. A Danish study (2015–2016) evaluated for the presence of fragrances in products included in the app “Kemiluppen,” which helps consumers identify ingredients in cosmetic products¹; fragrance was identified in 968 (83.5%) of 1159 shampoos and conditioners and 416 (80.6%) of 516 hairstyling products. Fragrance is a common allergen; in the most recent 2015 to 2016 North American Contact Dermatitis Group (NACDG) publication, 11.3% had positive reactions to fragrance mix I, 7% to BOP, and 5.3% to fragrance mix II.²³ Based on these data, we anticipate that patients with fragrance allergy will have difficulty finding allergen-free hair products. In fact, we identified only 1 fragrance-free ethnic shampoo, 1 conditioner, and 8 styling products; there is a need for more fragrance-free hair products for this population.

Cocamidopropyl betaine, a surfactant that lowers water surface tension in detergents,²⁴ was more common in nonethnic (82.7%) shampoos than ethnic shampoos (72.2%). In 2009 Zirwas and Moennich⁵ identified CAPB in only 95 (53%) of 179 shampoos, and a 2019 study on surfactants in the ACDS Contact Allergen Management Program (CAMP) identified CAPB in 162 (62.8%) of 258 shampoos.²⁵ This study focused on the top 100 products in each of 3 databases; perhaps, differences in frequencies can be explained by user preference. The 2015 to 2016 NACDG study noted CAPB to be positive in only 1.6% of tested patients²³; this chemical, although prevalent in products, has lower potential of causing contact allergy. Cocamidopropyl betaine was not commonly identified in conditioners or hairstyling products.

Interestingly, decyl glucoside, a plant-derived surfactant, was the no. 3 allergen (44.2%) present in ethnic shampoos but was present in only 11.3% of nonethnic shampoos. This is a desirable ingredient in ethnic hair shampoos because it is a nonanionic surfactant, believed to be a gentler/less drying alternative to sulfates. This alternative use of

surfactants could potentially account for the differences in CAPB noted between ethnic and nonethnic shampoos. Decyl glucoside was positive in 2.1% of patients tested by NACDG in 2015 to 2016.²⁶ This is higher than CAPB (1.6%) for the same period and highlights the importance of ongoing surveillance of allergens responsible for contact allergy, especially in patient populations that use ethnic hair products. Decyl glucoside was not recorded in ethnic conditioners or nonethnic styling products and was present in only 2 nonethnic conditioners and 1 ethnic styling product.

Cetyl steryl alcohol (cetearyl alcohol), a combination of the fatty alcohols cetyl and stearyl alcohol, is an emulsion stabilizer, opacifying agent, surfactant, and viscosity-increasing agent.²⁷ Cetyl steryl alcohol was identified in all 3 types of hair products and was the no. 2 allergen in both ethnic (81.3%) and nonethnic (98.6%) conditioners. This is a rarely reported allergen, with only a few case reports in the literature.^{28,29} A 2009 to 2012 European study reported contact allergy in only 0.76% of 29,248 tested patients³⁰; it is not currently tested in common screening series. Other studies have confirmed its presence in cleansing products. Cetyl steryl alcohol was noted in 25.8% of facial wipes³¹ and 7.1% and 6.3% of waterless skin soaps and skin disinfectants/surgical scrubs, respectively.³² This is a rare allergen with robust presence in hair conditioners; it is expected that allergy would be rare.

Preservatives are necessary components of cosmetic products and were identified in all 3 product types. Methylchloroisothiazolinone and methylisothiazolinone were common allergens, with positive reactions in 7.3% and 13.4%, respectively, in the 2015 to 2016 NACDG patch test population.²³ Deleo et al⁹ (1998–2006) reported MCI/MI to have a lower reaction frequency in Black (1.4%) than White (2.59%) patients (risk ratio, 0.54; $P = 0.0068$). Methylchloroisothiazolinone and methylisothiazolinone were the most frequent preservatives in nonethnic shampoos (57.3%) and conditioners (53.5%), but were identified in only 8.3% of ethnic shampoos and 12.5% of ethnic conditioners. In comparison, in 2009, Zirwas and Moennich⁵ found MCI/MI in 51% of 179 US-based shampoos, and in 2016, Scheman and Severson³³ documented MCI/MI in 53% of 253 shampoos and 45% of 179 hair conditioners in ACDS CAMP. Although nonethnic shampoos and conditioners in this study had similar utilization of MCI/MI to other studies, there was significantly less MCI/MI noted in ethnic shampoos and conditioners. The reason for this is not known, but could be related to consumer preference or because of chemical compatibility requirements.

The most common preservative in ethnic shampoos was sodium benzoate at 33.3%. This preservative only rarely causes contact allergy; sodium benzoate was positive in only 0.3% of female hairdressers and 0.6% of female hair clients in a European population (2007–2012).³⁴ Only rare allergy should be expected, but because it is commonly used in ethnic shampoos, patch test reaction frequencies in this population should be monitored.

Phenoxyethanol was the most commonly identified preservative in both ethnic conditioners (31.3%) and hairstyling products (40.7%). Phenoxyethanol is a rare allergen and was positive in only 0.2% of patients in a 2011–2015 Mayo Clinic study.³⁵ In addition,

phenoxyethanol was recently identified as the most common preservative in CAMP, in 23.9% of products.³⁶ Although phenoxyethanol is unlikely to be a common cause of ACD to hair products, because of its prolific use in ethnic hair products, patch test frequencies in this population should be monitored.

Formaldehyde releasers, another group of preservatives, were noted in shampoos and conditioners, with similar frequencies between ethnic (30.6%) and nonethnic (36.3%) shampoos but more represented in nonethnic conditioners (35.8%) than ethnic conditioners (15.6%). A difference was also noted between nonethnic hairstyling products (23.2%) and ethnic hairstyling products (9.8%). Formaldehyde releasers were present in 48% of shampoos in the 2009 study of Zirwas and Moennich.⁵ The difference in FR utilization between these 2 studies is likely real and due to less use of formaldehyde-releasing preservatives over time.

Tocopherol (vitamin E) is used in the United States as an antioxidant, fragrance ingredient, and skin-conditioning agent.²⁷ It had a higher frequency in ethnic shampoos (38.9%), conditioners (46.9%), and hairstyling products (44.3%) compared with nonethnic shampoos (28.7%), conditioners (33.8%), and hairstyling products (16%). We suspect this may be because it is frequently viewed as a natural antioxidant, as well as a conditioning agent, making it more widely accepted in products marketed as natural. In the 2015 to 2016 NACDG patch test population, tocopherol had a reaction frequency of 0.7%, making it an uncommon allergen.²³ However, because of its frequent use in ethnic hair products, patch test frequencies in this population should be monitored.

LIMITATIONS

Several limitations exist. The top products for each category were identified in 1 day in late 2018; product availability and ingredients change over time. In addition, online, in-store, and regional variations in product ingredients exist. Because of the smaller number of ethnic products available for ingredient review, differences in allergen frequency between ethnic and nonethnic products may not be directly comparable. The terms “ethnic hair” and “natural hair” may be interpreted differently by retailers, hair product companies, physicians, and patients.

CONCLUSIONS

This study stratifies ethnic and nonethnic hair products by their ACDS Core allergen content and provides a list of low-allergen ethnic hair products. Common hair allergens that are shared between ethnic and nonethnic hair products and already tested in standard screening series include fragrances, MCI/MI, MI, FRs, and tocopherol. Cetyl steryl alcohol is found in both ethnic and nonethnic hair products but may need to be tested in supplemental fashion. Decyl glucoside, sodium benzoate, and phenoxyethanol are more commonly found in ethnic hair products and may also need to be tested in supplemental fashion. Future studies on contact allergy in skin-of-color patients are encouraged.

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