

A Rare Eyelid Dermatitis Allergen: Shellac in a Popular Mascara

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WE REPORT FOUR CASES of eyelid dermatitis in women who were patch-tested with the standard tray of 65 allergens and their own products. All four women were found to be allergic to their own Maybelline Great Lash mascara (L'Oreal, Clichy, France). To investigate further, we performed patch tests with the individual ingredients of that mascara (provided by the manufacturer) and found that all four patients had an allergic reaction to the shellac in the mascara. Shellac is a natural resin produced by the insect *Laccifer lacca* and is mostly harvested in India for use in varnishes, food coatings, and cosmetics.

In 2002, six patients with eyelid dermatitis caused by an allergic reaction to Gemey Great Lash mascara (the European version of Maybelline Great Lash mascara, L'Oreal) were reported in France. Five of those patients were found to have positive reactions to patch tests with shellac.

Background

Eyelid dermatitis is an inflammatory condition with a broad differential. Allergic contact dermatitis is believed to be the most common type of eyelid dermatitis, having a prevalence of 34 to 74%.¹⁻³ Ingredients in cosmetics (including fragrances, dyes, and preservatives) are frequently implicated. However, only a handful of reports in the literature describe allergic contact reactions to mascara or to its specific ingredients. Those ingredients include quaternium-22, shellac, colophony, p-phenylenediamine, yellow carnauba wax, coathylene, black and yellow iron

oxides, and nickel.^{1,4-8} Furthermore, it is difficult to patch-test with mascaras because many of their ingredients are solvents and can be irritating.

The primary ingredients in mascaras are water, preservatives, pigments such as iron oxides, and waxes (to provide consistency and thicker coating of the eyelash hairs).

The following is a report of four female patients who presented with eyelid dermatitis and were found to be allergic to one specific mascara, Maybelline Great Lash mascara.

Methods

All patients were referred for evaluation of eyelid dermatitis and were seen in a specialty contact dermatitis clinic between September 2006 and June 2008. Numerous visits involved a thorough medical history and examination to identify any potential suspect allergens.

All patients were patch-tested with the 65 allergens on the North American standard allergen tray; many were also patch-tested with 36 allergens on our supplemental tray and with a 10-allergen plant tray.⁹ The North American standard tray allergens were obtained from Chemotechnique Diagnostics AB (Malmö, Sweden). Supplemental tray allergens were obtained from various sources and were designed to test for regional causes of allergic contact dermatitis. The plant tray had allergens from numerous sources to test for sesquiterpene lactone-containing regional plants. All patients used a variety of personal products that could have been relevant to their eyelid dermatitis, and they were patch-tested with those products.

Patch testing was done with a standardized technique with 8 mm Finn Chambers (Epitest Ltd Oy, Tuusula, Finland) on Scanpor tape (Norgesplaster Alpha AS, Vennesla, Norway) by dispensing approximately 3 mm segments of allergen in each chamber. When the allergen was a liquid, the filtered paper was wetted with the allergen, partially evaporated, and then applied to the

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Previously presented at the American Contact Dermatitis Society Annual Meeting in San Antonio, January 31, 2008.

DOI 10.2310/6620.2009.09009

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patient's back. The allergens, in Finn Chambers, were applied directly to normal uninvolved skin on the upper back. They were removed after 48 hours, and the patients were assessed for any skin reactions. The mascara was not waterproof, and the patients were instructed not to get their backs wet for 3 to 5 days, at which time those sites were reassessed. Mascara was applied to the Finn Chambers and allowed to become almost dry; the chambers were then applied to the patient's back. This method decreased the chance of an irritant reaction, which is often a problem when patch-testing with mascaras.

When patients were found to have a reaction to Great Lash mascara (spreading erythematous-to-vesicular plaques were considered positive reactions), they were then patch-tested with all 25 ingredients of the mascara. The ingredients were generously provided by the manufacturer and are listed in Table 1. Shellac 20% in 70% ethanol came in that concentration from the manufacturer. However, patients were also tested with shellac 20% in petrolatum (courtesy of J. Taylor, MD) on the basis of prior reports of patch testing that used both of those vehicles.¹⁰ Patch-test results were negative in 205 controls tested with shellac 20% in petrolatum. Ninety-two persons from that group were tested and had negative patch-test reactions to shellac 20% in 70% ethanol. All patch-test results were read according to the standards of the North American Contact Dermatitis Group.⁹

Table 1. Ingredients of Maybelline Great Lash Mascara in Patch-Test Concentrations

Cera alba (beeswax) 30% pet	Iron oxide #7 2% pet
Ozokerite 30% pet	Iron oxide #8 2% pet
Shellac 20% in 70% ethanol	Iron oxide #9 2% pet
Carmines 5% pet	Ultramarines 2% pet
Chromium oxide greens 0.5% pet	Mica (proprietary mineral) 5% pet
Chromium hydroxide green 0.5% pet	Titanium dioxide (as is)
Manganese violet 2% pet	Ferric ferrocyanide 2% aq
Glyceryl stearate 30% pet	Quaternium-15 2% pet*
Stearic acid 5% pet/palmitic acid 5% pet	Triethanolamine 2% pet*
Methylparaben 3% pet	Propylene glycol 100%*
Simethicone 10% pet	Sorbitan sesquioleate 2% pet*
Quaternium-22 0.1% aq	
Butylparaben 3% pet	

aq = aqueous; pet = in petrolatum.

*Not from the manufacturer.

Case Reports

Case 1

In December 2006, a 36-year-old woman presented with one episode of severe eyelid dermatitis. The patient had developed severe swelling and red itchy dermatitis on her upper eyelids 3 days after using a new mascara (Maybelline Great Lash mascara). She had a history of asthma and hay fever but no prior history of eczema. She had no recollection of using that brand of mascara previously; however, she had used a variety of mascaras for years. She was patch-tested with the North American standard tray, a supplemental tray, and nine of her personal products, including Great Lash mascara. She had numerous positive reactions, including reactions to jasmine, lanolin, balsam of Peru, nickel, fragrance mix, Compositae, ylang ylang, lavender, and skin nutrition therapy A serum, as well as a +++ vesicular reaction to Great Lash black mascara (Fig 1). When tested with the ingredients of the mascara, she had a ++ reaction to the shellac 20% in ethanol on days 2 and 7 (Fig 2 and Fig 3). Of interest, one of the initial patch-testing trays included shellac 20% in petrolatum, to which her reaction was negative. We also do not believe she had excited skin syndrome, as her positive reactions had some relevant past history here. Furthermore, when tested with the mascara again, together with the mascara ingredients, the patient reacted only to the mascara itself and to shellac 20% in ethanol.



Figure 1. Patient 1 with a positive reaction to Great Lash mascara on day 7.

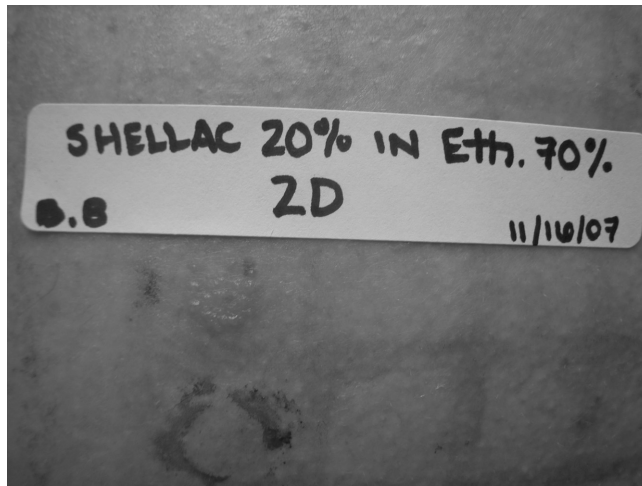


Figure 2. Patient 1 with a vesicular positive reaction to shellac 20% in 70% ethanol on day 2. Below the shellac is carmine-5 red pigment, which stained the skin. No dermatitis from carmine-5 was observed.

Considering the temporal relationship of the dermatitis to the use of Great Lash mascara, as well as the positive reaction to the mascara and shellac on patch testing, we believe the patient's eyelid dermatitis to be due to her use of Great Lash mascara. She does, however, react to many botanicals, and she will need to pick her skin care products accordingly. She has not had any episodes of eyelid dermatitis since she stopped using Great Lash mascara.

Case 2

In September 2006, a 23-year-old woman presented with an episodic itchy dermatitis on the upper and lower eyelids. She had had a total of four episodes over the

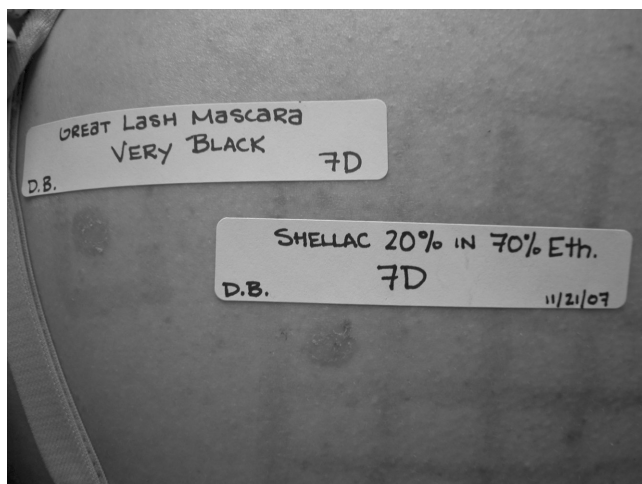


Figure 3. Patient 1 with positive reactions to Great Lash mascara and shellac 20% in 70% ethanol on day 7.

previous several months. The dermatitis temporarily resolved with oral prednisone topical hydrocortisone butyrate (Locoid, Astellas Pharma, Tokyo, Japan), and Aquaphor (Beiersdorf Inc., Norwalk, CT). She had no personal history of atopy although her mother had mild hay fever. There was no relevant occupational history. Her current mascara was Great Lash by Maybelline. She eventually stopped using all her cosmetics, and the dermatitis cleared within a week. The patient was patch-tested with the North American standard tray, a plant screen tray, and her own cosmetics, including Great Lash mascara. On day 2, she had no reactions; on day 7, however, she had ++ positive reactions to p-tert-butylphenol formaldehyde resin, bisphenol F epoxy resin, and Great Lash mascara. Only the positive reaction to the latter seemed relevant to her history of eyelid dermatitis. Initially, she had negative reactions to all 25 ingredients of the mascara, which included shellac 20% in 70% ethanol (reading days 2 and 7). Upon retesting with shellac at 5% and 20% in petrolatum, she was found to have a + reaction to 20% shellac in petrolatum (pet) at day 2, which persisted at day 7. The patient then switched to using Almay black mascara (Almay Inc., New York, NY) without shellac and has had no further recurrences.

Case 3

In the spring of 2006, a 43-year-old woman developed acute swelling, redness, and itching on her upper and lower eyelids, a condition that resolved spontaneously in several days. For the following 6 months, the patient continued to have episodic dermatitis of the upper and lower eyelids. She had a mild history of hay fever but no history of eczema or asthma. She handled hay and horses but noted no exacerbation of her dermatitis after those activities. On examination, she did have scaly erythematous plaques over the upper and lower eyelids. She was patch-tested with the North American standard tray, a supplemental tray, a plant screening tray, and 11 of her personal products. At days 2 and 7, the patient had a + positive reaction to Great Lash mascara. She stopped using Great Lash mascara and noted a complete resolution of her dermatitis. When tested with the ingredients of the mascara, she had a positive reaction to shellac 20% in 70% ethanol at both the day 2 and day 7 readings. She did not react to the shellac 20% pet.

Case 4

A 16-year-old woman was seen in June 2008 for evaluation of an upper- and lower-eyelid dermatitis that she had had

for 3 months. She felt that her symptoms started after she used stage makeup for a performance in a play. The dermatitis worsened with each performance. Her stage makeup included Great Lash mascara. There was no personal history of atopy, but she had a relative with hay fever. The patient was patch-tested with the standard and supplemental trays and to nine of her personal products. She did react to the mascara itself and to both shellac 20% in 70% ethanol (+) and shellac 20% pet only at the final reading on day 5. She has had no repeat episodes of dermatitis and has been able to wear the rest of her stage makeup since avoiding Great Lash mascara.

Discussion

Great Lash mascara is widely used in the United States, but reactions to it are extremely unusual. All our patients had itchy upper- and lower-eyelid dermatitis, either as an acute event following the application of Great Lash mascara or as a more recurrent chronic dermatitis for several months. All had a compelling story of using the same type of mascara (Maybelline Great Lash mascara), and all reacted strongly to their mascara on patch testing. In all of the cases, shellac was the only individual mascara ingredient to which there was a positive reaction on patch testing (Table 2). Avoidance of Great Lash mascara and substitution with other mascara (without shellac) resulted in the complete resolution of the eyelid dermatitis in all four women. Hence, we conclude that all four of our patients had eyelid dermatitis due to an allergic contact reaction to the shellac found in Maybelline Great Lash mascara.

Of interest, the shellac provided by the manufacturer came diluted in 70% ethanol. However, not all of our patients reacted to shellac in ethanol. A presentation by McDonnell and colleagues at the 2000 meeting of the

American Contact Dermatitis Society (ACDS) reported the use of shellac pet.¹⁰ All our patients were tested with 20% shellac pet, and only two had a positive reaction, hence the importance of testing with both vehicles. Perhaps some diversity in the reactions can be attributed to some small differences in the amount of shellac contained in each patch.

Shellac (CAS 9000-59-3) is a natural resinous secretion produced by the tiny red insect *Laccifer lacca* (*Tachardia lacca*),¹¹ whose name was recently changed to *Coccus lacca*. These insects are found mostly in India and Thailand. They swarm trees in huge numbers, eat the sap of the trees, internally process the sap, and excrete "lac" back onto the tree branches. The crude lac serves as a protective coating for the growing larvae of *Coccus lacca*. Workers cut down the lac-covered branches and transport it to the refining centers, where the leaves, insect remains, and other impurities are removed. After heat and chemical processing, the filtered resin appears as a yellow-to-brown thin flaky sheet. The dry shellac flakes are then sold worldwide for use in a variety of industries. The flakes are dissolved in an alcohol base, which transforms the shellac into a liquid that easily becomes a thin quick-drying film when coated onto a substance. The uses for shellac include use in wood varnishes, in protective and antimicrobial coatings for fruits and vegetables, and in the enteric coatings of pill capsules.¹² In the cosmetic industry, shellac has been used in eyeliners, lipsticks, and mascaras and as a coating and curling agent in hair dyes.^{5,10,13-15}

Skin sensitization to shellac is rare. Reports of allergic contact dermatitis from shellac describe eyelid dermatitis from mascara or eyeliner and a contact cheilitis from lipsticks.^{5,10,13-15}

In reviewing the literature, we found only 10 reported cases of allergic contact dermatitis from shellac in mascara

Table 2. Results of Patch Testing (Final Reading, Day 5 or 7) in Four Patients with Eyelid Dermatitis

Patient No.	Patch-Test Reactions			History of Atopy	Other Allergens Causing Positive Reactions
	Great Lash Mascara	Shellac 20% in Petrolatum	Shellac 20% in 70% Ethanol		
1	++	–	++	Asthma Hay fever	Jasmine, lanolin, balsam of Peru, nickel, fragrance, Compositae, ylang ylang, lavender, skin nutrition therapy A serum
2	++	+	–	–	Bisphenol-F epoxy resin, p-tert butylphenol formaldehyde resin
3	+	–	+	Hay fever	–
4	+	+	+	Relative with hay fever	–

Table 3. Literature Review of Allergic Reactions to Shellac in Mascara

No. and Country of Patients	Positive Patch-Test Reactions	Reference
1 patient, Italy	Shellac 5% aq triethanolamine in Diorshow mascara	14
6 patients, France	Shellac 20% in 70% ethanol (5/6) Quaternium-22 (1/6)	13
3 patients, USA	Gemey Great Lash Ultra Noir (6/6) Shellac 20% in petrolatum (3/3)	10
1 patient, USA	Shellac 20% in 70% ethanol Quaternium-22	5

aq = aqueous.

(Table 3).^{5,10,13,14} The most recent report (from Italy in 2005) described a case of allergic contact eyelid dermatitis due to shellac in Diorshow mascara.¹⁴ Another report described a case of contact dermatitis from shellac and quaternium-22 in an unnamed mascara that occurred in the United States in 1998.⁵ During the 2000 ACDS meeting, McDonnell and colleagues described three patients with shellac-induced dermatitis.¹⁰

In 2002, six eyelid dermatitis cases caused by an allergic reaction to Gemey Great Lash mascara (a European version of Maybelline Great Lash mascara) were reported in France.¹³ In five of those cases, the patients were found to have had positive patch-test reactions to shellac in ethanol.¹³ We report the first cases of allergic contact dermatitis caused by Great Lash mascara in the United States.

Conclusions

Maybelline Great Lash mascara is a popular brand of mascara in the United States; hence, we may be seeing a rare but emerging allergen, which should be considered while investigating causes of eyelid dermatitis. Furthermore, preparations in both petrolatum and 70% ethanol may be needed when testing.

Acknowledgments

Financial disclosures of author(s) and reviewer(s): None reported.

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