

Allergic contact dermatitis from shellac in mascara

CHRISTOPHE-J. LE COZ^{1,2}, JEAN-MARIE LECLERE³, ELISABETH ARNOULT⁴, NADIA RAISON-PEYRON⁵,
ANNICK PONS-GUIRAUD⁶ AND MARTINE VIGAN⁷ ON BEHALF OF THE MEMBERS OF REVIDAL-GERDA

¹Unité de Dermato-Allergologie, Dermatologie Professionnelle & Photobiologie, Clinique Dermatologique des Hôpitaux Universitaires de Strasbourg, Strasbourg, ²Cabinet de Dermatologie, Strasbourg, ³Cabinet Médical, Angers, ⁴Service de Dermatologie, Centre Hospitalier Universitaire, Reims, ⁵Cabinet de Dermatologie, Montpellier, ⁶Service de Dermatologie, Hôpital Saint-Louis, Paris, ⁷Cabinet de Dermatologie, Besançon, France

We report 6 cases of allergic contact dermatitis of the eyelids due to mascara. Allergy occurred in women aged 17–34 years, between September 1999 and June 2001. The main ingredient responsible for allergy was shellac, which gave positive patch test reactions in 5/5 patients. This resinous substance is mainly used in cosmetics, food and industry. The exact nature of the hapten remains unknown, and its presence and level in shellac can vary with the source and the treatments applied to it. One patient was also sensitized to quaternium-22, a quaternary ammonium compound in the cosmetic. These reports underline the rôle of networks, such as REVIDAL-GERDA, in monitoring the emergence of contact allergens and disseminating such information among the medical community.

Key words: allergic contact dermatitis; CAS registry number [9000-59-3]; CAS registry number [51812-80-7]; CAS registry number [82970-95-4]; cosmetics; eyelids; mascara; patch testing; quaternium-22; shellac. © Blackwell Munksgaard, 2002.

Accepted for publication 29 October 2001

Case Reports

Case no. 1 (Strasbourg)

A 26-year-old woman had a past history of allergic contact dermatitis with multiple sensitivities. She had had hand dermatitis 7 years before when a trainee hairdresser, and had reacted to costume jewellery and a toilet water. Patch tests in 1992 were positive to PPD, balsam of Peru (Myroxylon Pereirae) and fragrance mix, glyceryl thioglycolate, nickel sulfate and palladium chloride. More recently, she had suspected rubber gloves as causing contact dermatitis of her wrists. In September 1999, she developed an itchy dermatitis of the eyelids after applying a newly purchased mascara. Her pharmacist advised a yellow mercuric oxide ointment to be applied to the eyelids. The dermatitis dramatically worsened, spreading to the face, décolleté and left groin (Fig. 1). Lesions rapidly cleared after leaving off topicals and applying topical corticosteroids.

Patch tests were done 1 month later with the Finn Chamber technique on the upper back with the revised ICDRG series (1), additional routine allergens, thimerosal, and the patient's own top-

icals and cosmetics, including Great Lash® Ultra Noir mascara (Gemey, Clichy, France). Readings were performed at D2 and D3 as recommended by the ICDRG, and showed positive reactions to PPD +/+++, balsam of Peru +/++ and fragrance-mix +/+, and to nickel sulfate ++ with past relevance. Patch tests were also positive with current relevance to thiuram mix +/+, thiomersal –/+ and yellow mercuric oxide ointment (Oxyde mercurique jaune Chauvin®, Laboratoire Chauvin, Montpellier, France) +/+++, as well as to Great Lash Mascara Ultra Noir +/+0. Breakdown of fragrance mix led to positive reactions at D2/D4 to isoeugenol ++ and to eugenol +/–, and the rubber series was positive to tetraethylthiuram disulphide 0.25% petrolatum +/+. Breakdown of the mascara (ammonium hydroxide excepted) was then performed with the individual ingredients, some kindly provided by the manufacturer. They were diluted as recommended (2) or at our usual concentrations, namely beeswax 30% pet., ozokerite 30% pet., shellac 20% eth., glyceryl stearate 30% pet., propylene glycol 15% aqua, stearic acid 5% pet., triethanolamine 2.5% pet., sorbitan sesquiole-



Fig. 1. Acute dermatitis of the eyelids in Case no. 1.



Fig. 2. Sheets of pure shellac.

ate 5% (included in melamine-formaldehyde resin Chemotechnique®, Chemotechnique, Malmö, Sweden), methylparabens and butylparabens, each 4% in parabens mix 16% pet., quaternium-15 1% pet. (in ICDRG standard series), quaternium-22 0.1% and 0.01% aq., simethicone 10% pet., and CI 77495 as is. There were positive reactions at D2/D3 to shellac 20% eth. +/+ and Great Lash mascara as is +/+, but none to the other ingredients.

Case no. 2 (Strasbourg)

A 21-year-old woman had consulted several practitioners for a recurrent itchy dermatitis of her eyelids, which she related to a newly bought mascara. Patch testing was done with the revised

ICDRG series, additional allergens and the patient's own topicals and cosmetics, including Great Lash mascara (Gemey). Readings at D2 and D3 showed positive reactions to the Great Lash mascara +/+/+, and to cocamidopropyl betaine 1% aq., the last likely being irritant. Breakdown of the mascara was performed in two successive sessions with the same ingredients as before, and showed positive reactions to shellac 1% pet. ++, 20% and 1% eth. ++, 1% in dipropylene glycol + + +, 1% in isopropyl alcohol + +) and to quaternium-22 0.1% aq. and 0.01% aq., but not to 0.001% aq. Ethanol, isopropanol and dipropylene glycol tested as is were negative. Because of the unusual occurrence of such an allergen, tests to quaternium-22 were confirmed in a 3rd session.

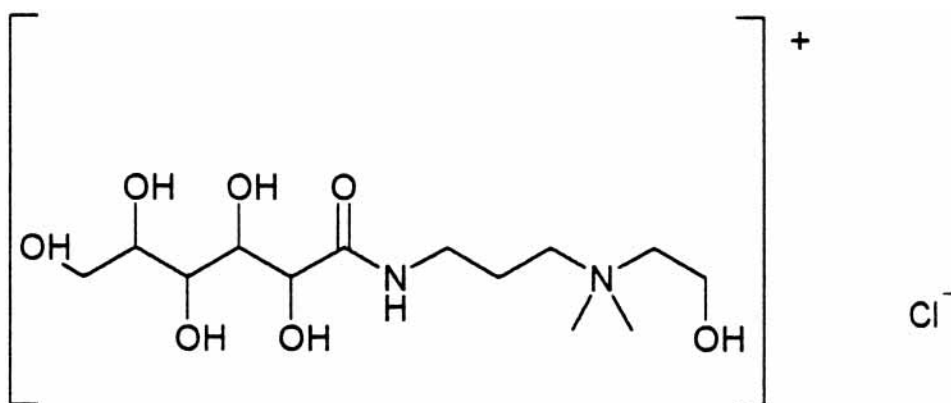


Fig. 3. Chemical structure of quaternium-22.

Case no. 3 (Angers)

A 34-year-old woman, with no history of allergy, presented in August 1999, after three episodes of contact dermatitis of her eyelids. Each episode had been preceded by the use of Great Lash mascara. Patch testing with the EECDRG standard series and the mascara gave positive reactions to fragrance mix +, and to the patient's own mascara + + +. Further patch tests confirmed sensitization to shellac 20% eth. giving a + + + reaction.

Case no. 4 (Reims)

A 21-year-old woman, with no previous history of atopy, was referred with an itchy dermatitis of the eyelids. Patch testing was performed with the EECDRG standard series and her own cosmetics, with positive reactions to potassium dichromate +, nickel sulfate + (of past relevance), PPD + and IPPD + + (with no relevance), and Great Lash mascara + + +. Further patch tests confirmed sensitization to shellac, with + + reactions to shellac at 20% and 1% eth. Other ingredients, except triethanolamine and propylene glycol, which were not tested, were negative.

Case no. 5 (Montpellier)

A 17-year-old patient was referred in May 2001 for eyelid dermatitis dating from 7 months before. She had had asthma until aged 12 years but reported no previous dermatitis. Patch testing was performed with the EECDRG standard series, additional cosmetic preservatives and the patient's own cosmetics, including two mascaras. Reading at D2 and D3 was positive to Great Lash mascara + +. Avoidance of this cosmetic resulted in total recovery. Breakdown of the cosmetic was subsequently performed with the individual ingredients, positive reaction at D2 and D3 being found to shellac 1% in dipropylene

glycol +/+, and 20% eth. +/+++. Dipropylene glycol and ethanol themselves were negative.

Case no. 6 (Paris)

This last case was observed in a 22-year-old woman who presented with eyelid eczema. Patch testing showed sensitization to Great Lash mascara with a + + reaction, and to nickel sulfate + +, with past relevance. Breakdown was however not performed in this patient.

Networking

The first authors C.J.L.C. and J.M.L. contacted the manufacturer Gemey, who provided them with patch test materials, and encouraged cooperation. In addition, signals came and went through the REVIDAL-GERDA network (3), allowing the collection and comparison of other observations, dispatch of test materials (authors A.P.G., M.V., E.A., N.R.P.), and publication of this report.

Discussion

The patients all presented with similar clinical features. Acute and/or recurrent itchy eyelid dermatitis strongly suggested the cause. Positive patch tests confirmed hypersensitivity and identified the causal ingredient as shellac.

Shellac, also called lacca, or gomme-laque, CAS registry number [9000-59-3], is the resinous secretion of an insect *Laccifer (Tachardia) lacca* Kerr., order Homoptera, of the Coccidae family, whose current name is *Coccus lacca* (4, 5). Shellac is secreted as a gummy resin, which dries and hardens into a protective covering, named lac, that initially acts as a protective shell for the insect's larvae. Lac is collected, crushed, washed, and dried. After further chemical treatment, it is drawn into thin sheets of finished shellac. The

level of refinement, timing of harvest, and source of the lac determine the grade/color of the commercially available product. Shellac is mainly available in thin sheets (Fig. 2), and used in the food, drug and cosmetic industries. Seedlac (lakh dana) is the raw material for the manufacture of handmade shellac, machine-made shellac, and dewaxed and decolorized shellac. India is the major producer of shellac, with a production of thousands of tons per year. Shellac cera, CAS registry number [97766-50-2], is a waxy substance used as an emollient and film former (6).

Shellac used to be used in the phonograph industry and has also been used in electrical insulation. It is currently employed in cosmetics for its emollient, film-forming and viscosity-controlling properties (6). Shellac or shellac wax, the waxy fraction of bleached shellac, can be used in pump or aerosol hair sprays, setting lotions, shampoos, nail polishes, or lipsticks. Its main cosmetic use is in eyeliners and mascaras, in which it is used as a curling agent. Shellac is also used as a skin-coating varnish (7), in pharmaceuticals, for microencapsulation in the conservation of fragrances and perfume oils, in the food industry for the coating of confections, chewing gum, candies, cakes, eggs, citrus fruits and apples, and in printing inks for eggs and cheese. Shellac is said to have both irritant and sensitizing properties (4, 7) but has seldom been reported as a cause of allergic contact dermatitis, except in mascaras (8) and a lipstick sealant (9). As a natural substance, its allergenic content depends upon its source, season collected and processing. Patch testing is recommended with shellac 20% eth. (2), which seems to correspond to its use concentration in mascara (8). The raw material is thought to be irritant (7), though tests with shellac as is were negative in 50 controls (9) and 1/23 controls had a +reaction to shellac 20% eth. (8). In our experience, dispersion in petrolatum is not easy to achieve because the great flexibility of the slivers requires their lengthy grinding. Dilutions in well-tolerated, non- or slowly-irritant solvents like isopropyl alcohol (isopropanol) or dipropylene glycol permit the elimination of false-positive reactions.

Concomitant sensitization to quaternium-22 was confirmed in Case no. 2. This quaternary ammonium salt is used as film-former, antistatic and hair-conditioning agent, mainly in mascaras, hair conditioners, soaps, shampoos and detergents (6). It has CAS registry numbers [51812-80-7] and [82970-95-4], and its chemical structure is shown in Fig. 3. Allergic reactions to quaternium-22 have been reported in one paper only,

also with concomitant sensitization to shellac (8).

These case reports prompt two concluding remarks. Firstly, they emphasize the rôle of surveillance systems like REVIDAL-GERDA and 'umbrella' collaboration among members, so as rapidly to clarify fresh findings implying new, recurrent or unusual allergens in dermatology. Secondly, as shellac is an inclusion of Great Lash mascara, the 'number one' in the USA as claimed in publicity material, it is surprising that no other cases have been reported there. One may, however, hypothesize a different composition, or suspect a transient impurity in certain batches of mascara sold in Europe.

Acknowledgment

Thanks are due to Dr. Elisabeth Pezant, Laboratoire Gemey, France, for her cordial assistance and provision of patch test materials.

References

1. Lachapelle J M, Ale S I, Freeman S et al. Proposal for a revised international standard series of patch tests. *Contact Dermatitis* 1997; 36: 121-123.
2. De Groot A C. Patch testing. *Test Concentrations and Vehicles for 3700 Chemicals*, 2nd edn. Amsterdam: Elsevier, 1994.
3. Vigan M. Le réseau de vigilance en dermatologie allergologique du GERDA. *Progrès en Dermato-Allergologie*, Lyon 1999. Paris: John Libbey Eurotext, 1999: 53-63.
4. Mitchell J C, Rook A. *Botanical dermatology. Plants and plant products injurious to the skin*. Vancouver: Greengrass, 1979: 472, 636-637.
5. Budavari S, O'Neil M J, Smith A, Heckelman P E, Kinnear JF, eds. *The Merck Index*, 12th edn. Whitehouse Station, NJ: Merck, Inc., 1996.
6. Wenninger J A, McEven G M, eds. *International Cosmetic Ingredients Dictionary and Handbook*, 7th edn. Washington DC: The Cosmetic, Toiletry, and Fragrance Association, 1997.
7. Rietschel R L, Fowler J F. *Fisher's Contact Dermatitis*, 4th edn. Baltimore: Williams and Wilkins, 1995: 762-763.
8. Scheman A J. Contact allergy to quaternium-22 and shellac in mascara. *Contact Dermatitis* 1998; 38: 342-343.
9. Rademaker M, Kirby J D, White I R. Contact cheilitis to shellac, Lanpol 5 and colophony. *Contact Dermatitis* 1986; 15: 307-308.

Address:

Christophe Le Coz
Unité de Dermato-Allergologie
Hôpitaux Universitaires de Strasbourg
1, Place de l'Hôpital
67091 Strasbourg
France
Tel: +33 3 88 11 66 27
Fax: +33 (0) 3 88 11 60 40
e-mail: christophe.lecoz@wanadoo.fr