

Contact allergy to para-phenylenediamine in a permanent eyelash dye

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We present the case of a 30-year-old atopic lady with a known history of intolerance to several materials, including dark stockings, who developed a severe dermatitis on the eyelids and peri-orbital regions, as well as a conjunctivitis after having her eyelashes tinted by a beautician with a permanent black eyelash and eyebrow dye (Combinal, Dr Temt Laboratories, Austria). Patch tests revealed positive reactions to para-phenylenediamine (PPD), both diluted 0.01% and 1% in pet., to the eyelash dye (tested semiopen as is) and to some of the azo-dyes tested. The permanent eyelash dye did contain PPD, the use of which is illegal but seems to be a common practice. The patient had most probably been sensitized through nylon stockings containing azo-dyes, with PPD itself cross-reacting to them. With the growth in popularity of tattooing and permanent make-up, doctors should be aware of the new uses of this old allergen. Moreover, although many manufacturers have made great efforts to improve cosmetics concerning their safety, some of them remain uninformed about cosmetic legislation or do not respect it at all. Because many of these products are acquired via internet, lack of legislation about this shopping modality is also a serious problem.

Key words: allergic contact dermatitis; Combinal[®]; conjunctivitis; cosmetics; dyes; eyelash; eyelids; para-phenylenediamine (PPD); permanent make-up. © 2006 The Authors. Journal compilation © 2006 Blackwell Munksgaard.

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The most common active ingredient in hair dyes is para-phenylenediamine (PPD), which is known to be one of the most potent contact allergens, both from experimental studies in laboratory animals and from human clinical experience (1, 2). The most common reaction to dyes containing PPD is delayed-type hypersensitivity, but immediate-type hypersensitivity reactions and even fatal anaphylaxis have also been reported (3–6). The classical target populations for this allergen are hairdressers and women (and to a less extend men) who dye their hair (7, 8). Another group of patients also at risk are Arabic men who dye their beards (9). Recently, the increasing number of cases of contact allergy to Henna tattoos adulterated with PPD, affecting also children, has also shed light to this allergen (10–14).

Case Report

A 30-year-old atopic lady developed a burning sensation in the eyes immediately after having her eyelashes tinted by a beautician with a permanent black eyelash and eyebrow dye (Combinal[®], Dr Temt Laboratories, Austria), which was followed

by a severe eyelid dermatitis and conjunctivitis beginning 1 day later and progressing through the next days. She had a history of sensitivity to nickel and cobalt (confirmed by patch tests) and had experienced eczematous reactions in the knee folds after wearing dark stockings, and had also reacted to a particular brand of mascara, however, without further investigations.

She consulted our department 2 weeks after this make-up procedure and presented with intense itching, erythema, swelling and exudation of both eyelids and a severe conjunctivitis, as well as eczema on the peri-orbital regions (Fig. 1).

Treatment with several eye drops and an antibiotic ointment had provided no relief, but application of hydrocortisone acetate 1% in an ophthalmic ointment had gradually cured the lesions over a 1-month period. She was patch-tested with the European standard battery (Trolab, Hermall, Germany) and the textile dyes (Chemotechnique, Malmö, Sweden), using van der Bend patch-test chambers (Brielle, the Netherlands) mounted on Micropore[®] (3M Health Care, Neuss, Germany) and fixed on the



Fig. 1. Acute dermatitis and conjunctivitis caused by a permanent eyebrow and eyelash dye containing para-phenylenediamine.

back with Mefix (Mölnlycke Health Care, Göteborg, Sweden). The eye-lash dye was tested as is semi-open: a minute amount of the dye was directly applied with a Q-tip on the skin, left to dry completely and covered with Micropore[®] tape. Test readings were performed after 2 and 4 days. Positive reactions (Table 1) to PPD, both diluted 0.01% and 1% in pet., as well as to the eyelash dye were observed. She also reacted to some of the azo-dyes tested: this could be relevant for the intolerance reactions she had experienced with nylon stockings before, which could probably be considered as the primary sensitization source for PPD derivatives, with PPD itself cross-reacting to them.

Discussion

The eyes are perceived socially as a mirror of the soul, yet from a dermatological point of view, the eyes represent a transition area between skin with the thinnest stratum corneum on the entire body and the moist conjunctival covering of the eye itself. Therefore, the desire to create fashionable eye cosmetics must be balanced with the need to insure that safety issues have been addressed. No harm must come to the eye from any coloured eyelid or eyelash cosmetic (15).

The FDA Act of 1938 prohibited the marketing of hair dyes for eyelash and eyebrow tinting because this practise has been known to cause severe eye injuries and even blindness. In 1933, two women had suffered severe reactions to a permanent eyelash product, called 'Lash Lure';

one woman became blind and the second woman died. This was the first product seized under FDA's authority. There are no colour additives approved by FDA for permanent dyeing or tinting of eyelashes and eyebrows (16). Nevertheless, some beauty saloons and other establishments continue to promote this use of hair dyes. This practice most often occurs during the summer months as a means of retaining eyebrow and eyelash colouring after outdoor activities such as swimming (17, 18). Topical antibiotics and preservatives (both from topical pharmaceutical products and cosmetics) are the leading allergens in eyelid-contact dermatitis and conjunctivitis. PPD, in association with lesions on or around the scalp, is sometimes implied when hair dyes are the cause (19–24).

Allergic contact dermatitis following the direct application of permanent eyelash and/or eyebrow dyes containing PPD has rarely been described: Hansson et al. (25) reported 2 PPD-sensitive patients who had reacted to 2-chloro-PPD present in a cream dye, and Bhat et al. (26) recently described a rather unusual case report of xanthelasma palpebrarum following its use. PPD has intermittently been banned in a number of European countries; most recently in Sweden in 1964. However, as the advent of the European Union and stricter regulation of the concentration allowed, PPD is used throughout the European Union (27). According to European legislation, PPD is authorized at a concentration up to 6% calculated as free base as an oxidizing colouring agent for hair dyeing. Besides these restrictions, warnings like 'Can cause an allergic reaction', 'Contains phenylenediamines', 'For professional use', 'Use suitable gloves' and 'Do not use to dye eyelashes or eyebrows' must be printed on the label (28). In Combinal[®] black, the first four warnings were present in the product's package, but the product was recommended as a dye for eyebrows and eyelashes. The manufacturer confirmed the presence of PPD in a 2.38% concentration, which in his opinion was in accordance to the European legislation. In <http://www.combinal.com>, this product is stated as the most popular eyelash dye in the world and is available in black, blue and brown colours, all containing PPD in decreasing order of concentration. According to www.aestheticnew.com, the Combinal[®] dye occupies the first and second place of the top 10 best sales with no critics to the products until now. Refectocil Tint[®], Fortune Dye[®] and Babor Eyelash Tint[®] are some other available brands of permanent eyelash dyes.

Table 1. Positive patch test results

Test results	Day 2	Day 4
Para-phenylenediamine (0.01%)	–	++
Para-phenylenediamine (1%)	++	+++
Disperse red 17 (0.5% and 1%)	+	+
Disperse red 1 (1%)	+	+
Disperse orange 3 (1%)	++	++
Disperse orange 1 (0.5%)	+	+
Combinal [®] as is semiopen	–	++

Several conclusions must be drawn from this clinical report. First, PPD remains an actual and important allergen, and unusual sources of PPD are becoming a reality, as stated above. Indeed, some individuals choose permanent make-up as a time-saver or because they have physical difficulty applying regular temporary make-up. With the growth in popularity of tattooing and permanent make-up, doctors should be aware of the new uses of this old allergen. Second, although many manufacturers have made great efforts to improve cosmetics concerning their safety, some of them remain uninformed about cosmetic legislation or do not respect it at all. Last but not the least, the current surveillance strategies to defend the costumer's health do not seem to be adequate, particularly because many of these products are acquired via internet.

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