

Para-phenylenediamine (PPD), an aromatic compound is used in permanent hair dyes; derivatives are found in photographic developers and lithography plates, photocopying machines, oils, greases, antioxidant/accelerator in rubber, and plastic industries (1, 2). More than two thirds of the commercially available hair dyes contain this ingredient (3, 4). Known to be a potent allergen, it has been considered hazardous. Thus, hair dyes containing PPD were, at one time, banned in Germany, France, Denmark, and Sweden (3).

Case Report

A 56-year-old senior sales manager of software presented with an atypical presentation of possible hypersensitivity reaction to a moustache dye containing PPD.

He had pruritic erythematous lesions on the face, penis and scrotum, and hyperkeratotic elbows, knees, and knuckles. The latter signs were psoriatic in nature. The patient was requested to discontinue using the moustache dye and skin care products he used on his face.

He underwent patch testing of: (i) routine series, (ii) extended routine series, (iii) hair dressers series, plus (iv) his personal products, including the moustache dye and the topical corticosteroids that he used (desonide and hydrocortisone valerate ointment 0.2%).

Finn chambers were applied to the upper back with the International Contact Dermatitis Research Group (ICDRG) scale readings at 2 D and 4 D (5).

Results showed positive (2+) to PPD 1% in pet. and toluene-2,5-diamine (PTD) (6) 1% in pet. only on the 96th-hr of reading. Clinical follow-up showed total clearing in 10.5 weeks.

Discussion

This patient reacted to PPD contained in his moustache dye. Allergy to PPD is most often delayed, type IV hypersensitivity reaction, although immediate hypersensitivity reactions have been reported (7, 8). The clinical manifestations of allergic contact dermatitis are pruritic erythematous lesions on the face, periorbital area, ears, and neck for scalp allergy. For moustache dye allergy, rashes are usually found on the perioral area. Our patient presented with rashes on the face and ears, and unusually, the lips, penis, and scrotal areas – an

Moustache *p*-phenylenediamine dye allergic contact dermatitis with distant site involvement – an atypical presentation

Contact Dermatitis 2008; 58: 179–180

Heidi P. Chan and Howard I. Maibach

Department of Dermatology, University of California, San Francisco, CA 94143-0989, USA

Key words: allergic contact dermatitis; anergy; compound allergy; delayed-type hypersensitivity; immediate-type hypersensitivity; para-phenylenediamine; patch testing; toluene-2,5-diamine.

atypical presentation. Our working clinical mechanistic hypothesis is that his hands spread the hair dye on the various areas – including his genitalia – to have produced the clinical syndrome. He stated that he did not dye his pubic hair. Positive patch test reactions to PPD are clinically often not traceable (personal observation). In this patient, the rapid clearing of lesions on dye cessation suggests a probable cause.

The product package label listed as active ingredients are *p*-phenylenediamine, PPD sulfate, *p*-aminophenol, *m*-aminophenol and hydrogen peroxide. He was patch test negative to the commercial dye – possibly because of the fact that the allergens were too dilute (1% dye in pet.). According to the New Zealand Dermatological Society, in addition to diluting PPD 1% in pet., they also mentioned that patch testing of 2% PPD may also be used (1). Secondly, it is also possible that, even though this patient is PPD and PTD reactive, the real allergen is a third allergen produced by the mixture, that is compound allergy (9).

The lack of dermatitis on the skin beneath the moustache is notable. This 'anergy' frequently occurs with the scalp hair dye allergic contact dermatitis. The mechanism for this sparing remains unknown. It is probably not because of decreased penetration, as hairy areas provide greater penetration than glabrous skin (10). Unfortunately, in spite of many studies, we have insufficient information on follicular transfer to ascertain if differences here could be relevant. Nor is it probably related to decreased ability of follicular laden skin to react, as the one controlled study comparing the scalp to glabrous skin failed to show a significant difference (11).

Taken together, the most interesting part of this gentleman's readily reversed clinical dilemma were: (i) spread to distal sites (as with nail varnish) (12), and (ii) the putative 'anergy' beneath the moustache.

References

1. DermNet Editorial Team. *Authoritative facts about the skin* from the New Zealand Dermatological Society, Inc. [WWW document]. URL <http://dermnetnz.org/dermatitis/paraphenylenediamine-allergy.html> (accessed on 10 April 2007).

2. Lachapelle J-M. The standard and additional series of patch tests. In: *Patch Testing and Prick Testing: A Practical Guide*, Chapter 4, Lachapelle J-M, Maibach H I (eds). Berlin, Heidelberg, Springer-Verlag, 2003: 80.
3. Rietschel R L, Fowler J F Jr. Contact dermatitis from food additive and dyes, dyes. In: *Fischer's Textbook of Contact Dermatitis*, Rietschel R L, Fowler J F Jr (eds). London, Williams & Wilkins, 2001: 693.
4. Mc Fadden J P, White I R, Frosch P J, et al. Allergy to hair dye. Its incidence is rising, as more and younger people dye their hair. *BMJ* 2007; 334: 220.
5. Wilkinson O S, Fregert S, Magnusson B et al. Terminology of contact dermatitis. *Acta dermatovener (Stockholm)* 1970; 50: 287–292.
6. De Groot A C, White I. Cosmetics and S.C. products. In: *Textbook of Contact Dermatitis, 2nd, Revised and Enlarged Edition*, Ryacraft R J G, Frosch P J, Menné T, et al(eds). Berlin, Heidelberg, Springer-Verlag, 1995: 470.
7. Wong G E, King C M. Immediate-type hypersensitivity and allergic contact dermatitis due to paraphenylenediamine in hair dye. *Contact Dermatitis* 2003; 48: 166.
8. Texeira M, De Wachter L, Ronsyn E, Goossens A. Contact allergy to paraphenylenediamine in a permanent eyelash dye. *Contact Dermatitis* 2006; 55: 92–94.
9. Lachapelle J-M, Maibach H I. Compound allergy, in the chapter, the methodology of patch testing. In: *Patch Testing and Prick Testing: A Practical Guide*, Chapter 3, Lachapelle J-M, Maibach H I (eds). Berlin, Heidelberg, Springer-Verlag, 2003: 56–57.
10. Maibach H I, Feldman R J, Milby T H, Serat W F. Regional variation in percutaneous absorption in man (Pesticides). *Arch Environ Health* 1971; 23: 208–211.
11. Zhai H, Fautz R, Fuchs A, Bhandarkar S, Maibach H I. Human scalp irritation compared to that of the arm and back. *Contact Dermatitis* 2004; 51: 196–200.
12. Liden C, Berg M, Farm G, Wrangsjö K. Nail varnish allergy with far-reaching consequences. *Br J Dermatol* 1993; 128: 57–62.

Address:

Howard I. Maibach, MD

90 Medical Center Way

Surge Building, Rm 110

UCSF

CA 94143-0989

USA

Tel: +1 415 4762468

Fax: +1 415 753 5304

e-mail: maibachh@derm.ucsf.edu