

55 cases of allergic reactions to hair dye: a descriptive, consumer complaint-based study

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Severe facial and scalp dermatitis following the use of permanent hair dyes has been reported in several cases. *Para*-phenylenediamine (PPD) is known as a potent contact allergen, and PPD is allowed in hair dye at a concentration of 6%. Hair dye reactions are usually diagnosed by the patients themselves, and adverse reactions to hair dye may not necessarily be recorded by the health care system, unless the reactions are especially severe. Based on this assumption, we suspected that hair dye dermatitis was occurring more frequently than reported in the literature. Consumer complaint-based data were obtained by advertising for persons with adverse reactions to hair dye. Among those responding to the advertisement, 55 cases of severe, acute allergic contact dermatitis were identified. The main symptoms were severe oedema of the face, scalp and ears, and clinically this was often mistaken for angio-oedema. The 55 cases comprised a total of 75 visits to the health service and 5 admissions to hospital. 18 persons had sick leave, which supports the impression of very severe dermatitis reactions. 60% were treated with antihistamine, while 52% were treated with corticosteroids. 29% of the cases were patch tested and all were found positive to PPD. Our data presented here clearly show that PPD and its derivatives in hair dye at the present concentrations presents a significant health risk for the population. Furthermore, the severe acute allergic skin reactions are often misdiagnosed in the health care system. The frequency of allergic contact dermatitis resulting from hair dye is likely to be underestimated. New methods to survey the frequency of adverse reactions should be considered.

Key words: allergic contact dermatitis; consumer complaint-based data; hair dye dermatitis; hair dyes; para-phenylenediamine; patch test. © Blackwell Munksgaard, 2002.

Accepted for publication 1 October 2002

Permanent hair dyes are most commonly based on *para*-phenylenediamine (PPD) or derivatives of PPD. PPD is known to be one of the most potent contact allergens, both from experimental studies in laboratory animals and from human clinical experience (1–3). In hair dye, PPD is allowed at a concentration of 6% (4). Recently, temporary tattoos made with black henna, reported to contain PPD, have caused a large number of allergic contact dermatitis cases, where PPD was shown to be the contact allergen (5–7). In several of these cases, severe facial and scalp dermatitis has developed following subsequent use of permanent hair dyes.

General population-based epidemiological studies find a range between 0.1% and 1% sensitized to PPD (8, 9). Among consecutively patch tested patients, the frequency of PPD allergy is 2–5% with wide regional variations (10). 1 study from India reports a frequency among patients of

11.5% (11). Occupational contact dermatitis from PPD is common in hairdressers, and is reported in 19% to 35% (12–14). Based on the literature, delayed-type reaction is by far the most common form, but immediate-type reactions and subsequent anaphylactic reactions have also been described (15–18).

Hair dye reactions may be severe, with scalp and facial oedema, which spreads to the ears, neck and shoulders. Hair dye reactions are usually diagnosed by the patients themselves because of the relatively close time correlation between exposure and development of contact dermatitis in the specifically exposed region. It is therefore probable that patients by themselves avoid further exposure, and do not involve the health care system unless the reaction is especially severe. Based on this assumption, we suspected that hair dye dermatitis was occurring more frequently than reported in the

literature. Through the Danish Consumer Council a survey of hair dye complaints was made. The purpose of the study was to elucidate the following issues: How frequent is an adverse reaction to hair dye? What is the clinical picture? What is the consequence and are there any long-term effects? How are the consumers with adverse reactions treated by physicians in the health care system? To obtain consumer complaint-based data, we decided to advertise for persons with adverse reactions to hair dye.

Materials and Methods

On behalf of the Danish Consumer Council, an advertisement was placed in October and November 2000 in the Council's monthly journal, published as 89200 copies. The advertisement called for people who had recently had an adverse reaction to hair dye. 88 persons responded in the period November 2000 to February 2002 by either a telephone call, e-mail, or a letter. Some were later contacted by telephone or mail to acquire further information.

Persons were asked the following standardized questions:

- age and sex;
- where they had their hair dyed (home-treatment or by a hairdresser);
- which product was used (permanent hair dye or a rinse);
- previous experience with hair dyes; and
- number of visits to the health service due to reaction to hair dye.

They were also asked to describe the symptoms related to the use of hair dye, and to report how they were treated by doctors in the health care system. The responses were examined by 2 dermatologists, and descriptions of symptoms compatible with allergic contact dermatitis were noted. On this background the inclusion criteria were defined as oedema of the face and/or forehead, eyelids, scalp, and/or suppurative/ulceration of the scalp and/or ears related to exposure to hair dye.

Results

A total of 55 persons were included in the study, 52 women and 3 men, mean age 43 years (range 18–71). Further, 33 persons had responded to the advertisement but their complaints did not fit the inclusion criteria, and they were not included.

43 had dyed their hair themselves (home-treatment) and 11 had had their hair dyed at a hairdresser's; 1 had done both. 51 had used permanent

Table 1. Clinical symptoms following exposure to hair dye

Symptom	Number of persons with symptom
Itching	29
Oedema of the face	25
Oedema of the eyelids	21
Oedema of the scalp	19
Ulceration on the scalp	17
Suppuration from the scalp	16
Eczema	15
Oedema or suppuration of the ears	12
Eczema in other places than scalp or face	11
Oedema of the forehead	10
Conjunctivitis	8
Swollen lymph nodes	7
Dizziness	4
Difficulty in breathing	4
Headache	2

Table 2. Visits to the health service due to adverse reaction to the use of hair dye. 7 persons did not contact the health service. 1 person had 4 visits to a dermatologist, and 3 persons had more than 1 visit to their general practitioner

Health service contacted	Number of visits to health service
General practitioner	37
Dermatologist	17
Duty doctor	9
Casualty	6
Admissions to hospital	5
Ophthalmologist	1
Total	75

hair dye and 3 had used a rinse; 1 did not know. 40 persons had previously dyed their hair, 2 persons answered that they had never dyed their hair before, while no information about previous hair dye was available for 13 persons.

12 persons reported that the skin symptoms started less than 1 day after hair dye exposure and 23 developed symptoms later than 1 day after, while 20 did not remember.

Symptoms reported to be related to hair dye are given in Table 1. As a consequence of the inclusion criteria the most commonly reported symptoms were oedema, suppuration and ulceration of the face, scalp and eyelids. Another main symptom was severe itching, reported by 29 persons. 11 reported spreading of the eczematous reaction to other areas of the body.

9 persons reported that they had made a skin test prior to the use of hair dye, as recommended by the manufacturer on the package (application of hair dye on the wrist 2 days prior to hair dyeing), and 16 had not. 30 persons did not answer the question.

13 persons forwarded a photo of the reaction



Fig. 1. An 18-year-old woman with a severe, oedematous allergic reaction to hair dye.



Fig. 2. A woman with an allergic reaction to hair dye. The picture was taken 4 days after colouring the hair.

that supported/confirmed the diagnosis of allergic contact dermatitis (Figs 1 and 2).

Visits to the health service are shown in Table 2. The adverse reactions in the 55 persons included led to a total of 75 contacts with the health service, including 5 admissions to hospital. Additional to the information in Table 2 1 person was an outpatient.

7 persons never saw a doctor and received no treatment. 14 persons visited a dermatologist, but only in 8 cases was a patch test performed. On the initiative of the Danish Consumer Council, another 8 persons were patch tested later, and patch test results relevant to the use of hair dye are given in Table 3. All persons tested reacted positively to PPD.

3 persons spontaneously reported having had a semipermanent tattoo, but this question was not asked consequently in all cases. Medical treatment prescribed for the reactions is shown in Table 4. A total of 33 persons were treated with antihistamine, and 29 persons were treated with corticosteroids. 7 persons were treated i.m./i.v. with antihistamine, corticosteroids or adrenaline. 1 person was suspected to have mumps.

In 23 persons the dermatitis lasted for more than 3 weeks. The symptoms were itching, redness, scaling and persistent oedema. 2 persons reported hair loss.

18 persons reported sick leave due to their hair

dye-related symptoms (range 1–21 days, mean 7 days); 5 were admitted to hospital (range 1–5 days).

Of the initial 88 persons who responded to the advertisement, 33 subjects were excluded from the study since they did not fit the inclusion criteria. Complaints in this group were mainly severe hair loss (14 persons), chronic eczema (9 persons), itching (9 persons), open wounds on the scalp (5 persons), headache (4 persons) and dizziness (2 persons); 1 subject had bladder cancer, and 1 had a lymphoma. Whether these symptoms were related or not to hair dye falls outside the scope of this study, since we decided to look only at acute dermatitis reactions compatible with allergic contact dermatitis.

Discussion

55 cases of severe acute contact dermatitis of face and scalp following use of hair dyes are presented. 29% of the cases were patch tested and all were found positive to PPD.

This group of Danish persons was collected among 88 persons who reacted to an advertisement calling for persons with adverse reactions to hair dyes. Traditionally, studies on adverse reactions to hair dye have been on specific groups (consecutive eczema patients, hairdressers, etc.). How-

Table 3. Results of patch tests in 16 persons tested. All were tested with a standard series, and most were also tested with a series of hairdresser allergens, but the series used were not standardized with regard to the allergens included. In addition to the contact allergies presented in the table, some persons reacted to the following allergens in the standard series: fragrance mix (3), potassium dichromate (1), para-tertiary-butylphenolformaldehyde resin (1), methyldibromoglutaronitrile (1), nickel sulfate (5) and colophonium (1).

Allergen	Number of positive reactions
Para-phenylenediamine (PPD)	16
Toluenediamine	7
Aminoazobenzene	6
Nitro-PPD	5
3-Aminophenol	3
4-Aminophenol	3
Ammonium persulfate	3
Ammonium thioglycolate	2
Disperse orange	1
Diaminophenol	1

Table 4. Pharmaceuticals prescribed in connection with adverse reactions to hair dye. Data for treatment were available for 48 persons. 9 persons had no treatment

Type of drugs used	Number of patients treated
Systemic antihistamine	28
Systemic corticosteroid	15
Topical corticosteroid	14
Antibiotic, local/systemic	10
Topical antihistamine	5
Local analgesic	2
Adrenaline	1

ever, these studies may not show the true picture of the occurrence of adverse reactions to hair dyes. As the relationship between exposure to hair dye and the subsequent development of symptoms is usually quite obvious to the consumer, many cases are probably never registered by the health care system. The present study used the different approach of advertising for consumers who had experienced adverse reactions to the use of hair dyes. The study cannot give information about the true frequency of acute contact allergic skin reactions from hair dyes, but the fact that from an advertisement printed twice, we were able to identify 55 cases indicates that this type of reaction is not uncommon.

Nearly all reactions were related to the use of permanent hair dyes, and the majority of adverse reactions were related to home-treatment. This confirms a recent report from Sweden, where home-treatment significantly more often caused adverse reactions than professional treatment at a hairdresser (19). The dermatitis pattern is rather uniform, with severe oedema of the face, scalp, eye-

lids and ears, though clinically this is often mistaken for angio-oedema. The 55 cases had a total of 75 visits to the health service and 5 admissions to hospital, while 18 had sick leave, which supports the impression of very severe dermatitis reactions. Adverse reactions to hair dye reported in the literature also include even more extreme reactions such as anaphylaxis (15–17), but none in our group reported such symptoms.

2 of the persons with an allergic reaction also reported hair loss. Hair loss (telogen effluvium) has been reported to be induced by allergic reaction to hair dyes (20).

Less than 1/3 of the patients were examined by a dermatologist, and only in 14% of the 55 cases was an attempt made to identify the eliciting allergen. This illustrates that the patients themselves as well as the health care system may fail to diagnose and adequately treat severe adverse reactions to hair dyes. The misdiagnosis of acute adverse reactions to hair dyes is further illustrated by the fact that most patients seen by a doctor were treated with systemic antihistamines (see Table 4).

Incomplete allergy investigation leads to underestimation of the problem, and also to deficient diagnosis. This paper shows that severe allergic reactions to hair dyes are not an uncommon phenomenon. A recent Swedish study compared the frequency of PPD allergy in dermatitis patients for the period 1943–92, when PPD in hair dyes was prohibited in Sweden, and for the period since 1993 when it was allowed again (19). There was no significant difference between the 2 periods. The reason may be, as shown in this study, that most patients with adverse reactions to hair dyes are not seen by a dermatologist and not patch tested. Our data presented here clearly show that PPD and its derivatives in hair dye at the present concentrations presents a significant health risk for the population. Therefore safe technical alternatives to PPD under development are strongly needed. Furthermore, the severe acute allergic skin reactions are often misdiagnosed in the health care system.

Apart from allergic reactions other severe adverse reactions have been suspected (15–17) and recent epidemiological studies have linked the use of permanent hair dyes to an increased risk of developing bladder cancer (21,22).

Conclusion

Our current knowledge about the frequency of adverse reactions to hair dyes is inadequate, and our consumer complaint-based data indicate that many cases may be overlooked. The clinical reaction is severe, the condition is often misdiagnosed in the health care system, only a few cases are re-

ferred to a dermatologist and even fewer are patch tested. The frequency of allergic contact dermatitis from hair dyes is likely to be underestimated. In our material a positive reaction to PPD was found in all persons who underwent patch testing. A reduction of PPD concentration and its derivatives in hair dye is needed, and further work of threshold limits of PPD and its derivatives is required.

New methods to survey the frequency of adverse reactions to hair dye need immediate consideration. The total number of products sold is irrelevant, and legal considerations about acceptable levels for human exposure to PPD should be based on the number of recorded cases of adverse reactions.

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