

Contact Dermatitis in Hairdressers, 10 Years Later: Patch-Test Results in 300 Hairdressers (1994 to 2003) and Comparison with Previous Study

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Background: In the last 20 years, the hairdressing profession has undergone important modifications, mainly because of a change in the substances and techniques used and improved occupational education.

Objective: To evaluate the modifications in the hairdressing profession and its actual risk of occupational allergic contact dermatitis (OACD).

Methods: We studied all 300 hairdressers seen in our department from 1994 to 2003 and compared the results with those of a previous study of 379 hairdressers who attended our department from 1980 to 1993. All were patch-tested with the European Standard series and specific hairdressing products. As previously, most of the workers were women (93%), with a mean age (23.7 years) slightly higher than that of the workers in our previous study.

Results: We found a significant increase in the frequency of positive patch-test responses (78.3% vs 58.8%) and OACD (58% vs 48.8%) with respect to our previous study. We also observed a significant increase in sensitization to most allergens, including p-phenylenediamine base (54% vs 45.9%), 4-aminobenzene (40.7% vs 31.9%), ammonium thioglycolate (2.7% to 12.3%), ammonium persulfate (7.9% to 14.3%), p-toluenediamine sulfate (6.8% to 15.3%), p-aminodiphenylamine (2.9% to 7.7%), o-nitro-4-phenylenediamine (2.1% to 7.3%), and aminophenols (0% to 9%), whereas a decrease was found in sensitization to Disperse Orange (17% vs 32.7%) and thioglycolic acid (15.3% to 3%).

Conclusion: The high frequency and increase of sensitizations among hairdressers require urgent measures to improve protective measures and their application.

IN THE LAST 20 YEARS, the hairdressing profession has undergone important modifications, mainly because of a change in the substances and techniques used and improved occupational education. To evaluate those effects and to determine the actual risk of occupational allergic contact dermatitis (OACD) among hairdressers, we studied all 300 hairdressers seen in our department from 1994 to 2003 and compared the results with those of a previous study of 379 hairdressers who presented to our department from 1980 to 1993.¹

Materials and Methods

We retrospectively studied the clinical histories of all hairdressers who presented to our department for the assessment of occupational skin diseases from 1994 to 2003.

During this period, 7,510 patients were seen, of which 320 were hairdressers (299 women and 21 men). Twenty patients were excluded from the study because they had not concluded the patch testing. In regard to the 300 patients who were included, clinical histories, physical examinations, and patch tests with the European Standard series and a hairdressing series had been carried out on all of them, as well as patch tests with an additional series according to the individual risk of each patient. The rubber chemicals and all allergens for standard patch testing were supplied by Chemotechnique Diagnostics (Malmö, Sweden). All tests were applied to the upper back and were secured with self-adhesive Fixomull (Beiersdorf, Hamburg, Germany). The strips were removed after 2 days, and readings were done on day 2 and day 4. Statistical analysis was performed with Student's *t*-test. Values of $p < .05$ were considered significant.

Results

Of the 300 included patients, 280 (93%) were women and 20 (7%) were men, which may be explained by the female

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Table 1. Comparison of Positive Patch-Test Reactions to Principal Allergens in the 1980–1993 and 1994–2003 Studies

Principal Allergen	% of Evaluated Hairdressers		Statistical Significance (p)
	1994–2003	1980–1993	
4-Phenylenediamine (PPD)	54.0	45.9	< .05
4-Aminobenzene	40.67	31.9	< .05
Nickel sulfate	37.0	41.4	NS
Disperse Orange	17.0	32.7	< .05
p-Toluenediamine sulfate	15.33	6.8	< .05
Ammonium persulfate	14.33	7.9	< .05
Aminophenols	9.0	0.0	< .05
Ammonium thioglycolate	12.33	2.7	< .05
Kathon	10.67	8.5	NS
p-Aminodiphenyldiamine	7.67	2.9	< .05
o-Nitro-PPD	7.33	2.1	< .05
Cobalt chloride	6.0	7.3	NS
Potassium persulfate	5.53	3.4	NS
Thimerosal	4.33	0.2	< .05
Glyceryl monothioglycolate	4.0	2.7	NS
Chromate	3.67	1.0	< .05
Thiuram mix	3.67	0.5	< .05
Thioglycolic acid	3.0	15.3	< .05

NS = not significant.

predominance in the hairdressing profession. The mean age of the hairdressers studied was 23.7 years; actual ages ranged from 15 to 58 years. Fifty-five (18.3%) of the patients had been working in this trade for less than 1 year, 70 (23.3%) had worked from 1 to 3 years, and 176 (58.7%) had worked for more than 3 years.

Twenty-eight patients (9.3%) adopted no protective measures. However, most hairdressers occasionally used plastic or rubber gloves, especially for coloring. The mean time between the start of the hairdresser's career and the development of the lesions was 52 months. In 285 patients (95%), the hands were affected.

Ninety-seven hairdressers (32.3%) had a personal history of atopic disease. In this group, OACD was diagnosed in 58 patients, non-OACD was diagnosed in 2 patients, irritant contact dermatitis (ICD) was diagnosed in 20 patients, and clinical atopic dermatitis was diagnosed in 9 patients.

A positive patch-test response to one or more of the allergens tested was presented by 235 patients (78.3%). OACD was diagnosed in 174 patients (58%), and non-OACD was diagnosed in 16 patients (5.3%); for 45 patients, the positive patch-test results were not relevant to the skin problems. Of the patients with negative patch-test results, 42 were diagnosed with occupational diseases; of these

patients, 41 had ICD, 1 had occupational asthma from persulfates, and 1 had allergic contact urticaria from latex. Twenty-three patients had a cutaneous reaction that was unrelated to their profession (acne, psoriasis, atopic dermatitis, mycosis, etc). In total, 60 (20%) of the hairdressers were diagnosed with ICD, and 20 (6.6%) were diagnosed with atopic dermatitis. Eight patients had a positive prick-test reaction to latex, and one patient presented with allergic contact urticaria from latex.

As shown in Table 1, the most frequent sensitizations shown by positive patch-test responses were to 4-phenylenediamine (PPD) (54%), 4-aminobenzene (40.7%), nickel (37%), Disperse Orange (17%), p-toluenediamine (15.3%), ammonium persulfate (14.3%), aminophenols (9%), ammonium thioglycolate (12.4%), and Kathon (methylchloroisothiazolinone/methylisothiazolinone) (Rohm and Haas, Philadelphia, PA) (10.7%).

Discussion

The mean age of the hairdressers in the present study was 23.7 years, which means that hairdressers develop skin problems early in their job life and consult a physician early on. One hundred twenty-five patients (41.6%) had been working for less than 3 years, and in 155 (51.7%) of

the patients, the lesions occurred less than 1 year before consultation. This was probably because irritant dermatitis is increased among hairdressers and may start early, which may facilitate the development of sensitization. These results are similar to those of previous studies¹⁻³ although the mean age was slightly higher in our present study than in our previous study (23.7 years vs 21.3 years) and although fewer patients developed skin lesions during the first 3 years of their job life (41.6% vs 68.0%). This might be due to an improvement in the adoption of protective measures. In our present study, 9.3% of patients did not adopt adequate protective measures, a percentage that is still unacceptably high but much better than the 25.3% in our previous study.

According to other studies,¹⁻⁷ the hand is the site most commonly affected (95% in our study), maintaining the evolutionary pattern of the lesions from an initial irritant contact dermatitis to allergic contact dermatitis.

In the present study, we confirmed that at the time of consultation, OACD was more common among hairdressers than was occupational ICD (58% and 20%, respectively), which is in accordance with other studies, including our previous one.^{1,8}

With reference to epicutaneous tests, PPD remains the allergen with the greatest sensitizing capacity and has an even higher frequency of sensitivity in this study than in our previous one (54% vs 45.9%). Our data disagree with those of Sun and Cheng,⁹ who concluded that the allergen with the greatest sensitizing capacity was nickel sulfate (PPD was fifth), but coincide with those of Armstrong and colleagues and Leino and colleagues.^{6,8} We agree with Armstrong and colleagues on the importance of revising the legislation concerning the maximum permitted concentration of PPD in hair dyes. Although PPD is still the major sensitizer, there has been a significant increase in sensitization to p-toluenediamine sulfate (6.8% to 15.3%), p-aminodiphenylamine (2.9% to 7.7%), and o-nitro-p-phenylenediamine (2.1% to 7.3%), making the permanent coloring agents of oxidation the most important group of allergens for hairdressers.

There was also an important increase in the frequency of sensitization to the semipermanent coloring agents 4-aminobenzene (31.9% to 40.7%) and the aminophenols (0% to 9%), in contrast with the decrease in frequency of sensitization to the azoic colorings Disperse Orange and Disperse Yellow (from 32.7% to 17% and from 4.2% to 3%, respectively).

There was a slight decrease in sensitization to nickel sulfate and cobalt chloride and an increase in the frequency of sensitization to chromate and mercury with

respect to our previous study. Nickel sulfate remains, however, the third important allergen for hairdressers, owing probably to the frequent use of metallic equipment and to low-quality imitation jewelry and piercing. The frequent use of thioglycolic acid among hairdressers favors the liberation of metals such as nickel.¹⁰

Protective measures may also induce sensitization. In this study, we observed an increase in sensitization to rubber allergens, especially thiuram components, probably because of the use of rubber gloves, which has increased from 74.7% to 91.7% among hairdressers. Protection of the hands would be safer with the use of vinyl gloves as suggested by van der Walle and Brunsveld.¹¹

There was a significant increase (from 0.2% to 4.3%) in sensitization to thimerosal, which is present in cosmetics used by hairdressers but which may also be found in other products such as topical and systemic drugs, liquids for contact lenses, and products used for vaccinations and allergy tests.

Sensitization to cocamidopropyl betaine, which is present in shampoos and cosmetics, remains low as observed by Lin-Hui and Sun and by Armstrong and colleagues.^{12,13} However, sensitization to captan increased significantly, perhaps because of its presence in shampoos.¹⁴

In regard to decolorizers and bleaches, there was a surprising increase in sensitization (from 0% to 1.67%) to hydrogen peroxide (which is, however, considered to be a very rare sensitizer),¹⁵ as well as a significant increase in sensitization (from 7.9% to 14.3%) to ammonium persulfate, a bleach.

In regard to the ingredients of permanent-wave liquids, an important increase in sensitization to ammonium thioglycolate (from 2.7 to 12.3%) was observed, in contrast to the important decrease in sensitization to thioglycolic acid (from 15.3% to 3%).

In the group of preservatives, Kathon CG remains the major sensitizer, and the frequency of sensitization to it even increased (although not significantly) from 8.5% to 10.7%, probably because of the increasing use of hair cosmetics and the higher use of cosmetics as beauty aids by the workers. However, sensitization to formaldehyde, which is present in shampoos, decreased slightly but remains similar to that found in other studies. There was also a significant increase (from 0.2% to 1.3%) in sensitivity to quaternium-15, which is considered to cause sensitization infrequently.

We agree with van der Walle⁴ and with Ling and Coulson⁵ that the number of sensitizations might be significantly reduced with better packaging, labeling, and application of the products; revision of the maximum

permitted concentrations of the principal allergens in hairdressing products; insistence on the use of protective vinyl gloves, starting in apprenticeship; and the establishment of rules that require resting or eating areas in hairdressing salons and academies to be completely separated from hairdressing products.

Conclusion

Hairdressing remains a trade with a high risk of sensitization, particularly among young women. We observed a significant increase in sensitization to several allergens in the European Standard series and hairdressing series with respect to our previous study, an observation that asks for urgent measures to improve protective measures and their application.

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Appendix

Practical Recommendations for Lowering the Frequency of Sensitizations among Hairdressers

1. Medical examination of all applicants for hairdresser training
2. Avoidance of the hairdressing profession by those with a history of atopy, eczema, asthma, or irritable skin
3. Adoption of adequate protective measures whenever possible (with disposable vinyl or nitrile gloves, from the beginning) when hair dyes and permanent-wave liquids are used
4. Proper cleaning of equipment and use of a container for the application of hair dyes
5. Rapid consultation with a dermatologist when cutaneous lesions appear