

Allergic contact dermatitis to the hair dye 6-methoxy-2-methylamino-3-aminopyridine HCl (INCI HC Blue no. 7) without cross-sensitivity to PPD

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p-Phenylenediamine (PPD) is used as a screening agent for hair dye contact allergy in the European baseline series. Evaluations based on the exposure from consecutively patch-tested patients generally confirm that PPD is an acceptable screening agent for hair dye allergy (1).

6-Methoxy-2-methylamino-3-aminopyridine HCl (INCI name HC Blue no. 7; CAS 83732-72-3) is used as a precursor in oxidative hair dye products. In 2003, an opinion from the EU Commission's Scientific Committee on Cosmetic and Non-Food Products (SCCNFP) indicated that the substance is normally used by the consumer at a maximum final concentration of 1% when mixed with hydrogen peroxide. The opinion of the SCCNFP was that 'The information (at that time) submitted (to the committee) is insufficient to allow an adequate risk assessment to be carried out. Accordingly, the SCCNFP considers that it is not possible to assess the safe use of the substance' (2). As of 2008, there is no upper limit for the use of the substance regulated in the EU Cosmetics Directive (3).

According to the cosmetics industry, the amount of HC Blue no. 7 used in hair dye products is more than 2000 kg per year. The local lymph node assay shows that the substance has sensitizing properties with an EC3 value 5.6% (E. Høting,

Schwarzkopf & Henkel GmbH, Hamburg, personal communication). The compound can be classified as a strong sensitizer (4).

The following case concerns the first reported case of contact allergy to HC Blue no. 7 in a consumer.

Case Report

A 65-year-old woman had coloured her hair with oxidative hair dyes five times a year for more than 15 years. Three days after she last used a hair dye, she developed severe oedema around her eyes and exudation from the scalp and ears. She required hospital treatment.

Patch testing with the European baseline series (Hermal Trolab,[®] Reinbeck, Germany) and read on D2 and D3 produced no reactions. Later, additional testing with individual ingredients in the hair dye product she had last used [provided by the manufacturer (Schwarzkopf & Henkel GmbH, Hamburg, Germany)] was undertaken. Eight-millimetre Finn Chambers (Epitest Ltd, Tuusula, Finland) on Scanpor[®] tape (Alpharma AS, Oslo, Norway) were secured by 3M tape. The chambers remained in place for 2 days, and readings were made according to the International Contact Dermatitis Research Group (ICDRG) scale of reading (5). In relation to these patch tests, there was a flare-up reaction with redness

and itching on the ears and on the back. The only positive reaction was D3 follicular and D7 ++ to HC Blue no. 7 1% pet. (Table 1). Figure 1 shows the patch test reaction to HC Blue no. 7 1% pet. on D7. HC Blue no. 7 1% pet. was tested on 54 consecutive eczema patients, which resulted in 49 negative reactions and 5 irritant reactions, read according to the ICDRG guideline (5).

Discussion

Contact allergy to HC Blue no. 7 is reported for the first time in a consumer. To improve the patch test series to hair dye ingredients, a quantitative structure activity relationship analysis of 229 hair dye substances was carried out in 2002 (6). At that time, we had no information on the use of HC Blue no. 7 and it was not included in the analysis. We tested 49 other patients with HC Blue no.7 and found 5 persons with irritant reactions. The SCCNFP described a study that showed slight burning accompanied by a slight erythema in 2/10 volunteers who had one drop of 10% aqueous solution applied repeatedly at 30 min.

The present patient was negative to PPD and all other ingredients in the hair dye product used, except for HC blue no. 7. Patients with clinical hair dye reactions, a negative patch test to PPD but positive patch test to

Table 1. Patch test results with a hairdresser's series of contact allergens and supplemental ingredients from the used product 'Brilliance Black', an oxidative hair dye, Schwarzkopf^a

Patch test material	Ingredient in the product	Patch test result
<i>p</i> -Phenylenediamine	No	—
Resorcinol	Yes	—
Toluene-2,5-diamine	Yes	—
2-Methylresorcinol	Yes	—
2,7-Naphthalenediol	Yes	—
<i>m</i> -Aminophenol	Yes	—
2-Amino-3-hydroxypyridine	Yes	—
4-Amino- <i>m</i> -cresol	Yes	—
HC Blue no.7	Yes	++
Fragrance in the hair dye ^b	Yes	—
Colour base ^c	Yes	—

—, negative patch test result.

^aThe above hair dye substances are given by their INCI name; they were all tested in 1% in pet. The substances were read on D2, D3, and D7 expect for *p*-phenylenediamine which was only read on D2 and D3. HC Blue no. 7 (CAS 83732-72-3; EINECS 2806229; name on the product label: 6-methoxy-2-methylamino-3-aminopyridine HCl; IUPAC chemical name 3-amino-2-methylamino-6-methoxypyridine dihydrochloride). Positive reactions were read according to the ICDRG recommendations.

^bThe fragrance content in the used hair dye was tested in 1% pet.

^cUndiluted colour base without dyestuff precursors, without perfume, adjusted to pH 7.



Fig. 1. Patch test reaction to (HC Blue no. 7) 6-methyl-2-methylamino-3-aminopyridine HCl. Photo taken on D7.

2,7-dihydroxynaphthalene; 2-amino-methyl-*p*-aminophenol-2HCl; 3-nitro-*p*-hydroxyethylaminophenol; and 4-amino-3-nitrophenol (7–12) from hair dyes have been described previously. An epidemiological study in Denmark based on questionnaire methods or oedematous hair dye reactions affects 5.3% of the population dyeing their hair (13). General population-based patch test studies within the same geographical region shows that contact allergy reactivity to PPD is far lower than this figure (14). Isolated reactions to hair dyes not cross-reacting to PPD might be one explanation for these differences.

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