

Two cases of eyelid dermatitis caused by cobalt in colour cosmetics

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doi:10.1111/cod.12669

Key words: allergic contact dermatitis; case report; cobalt; colour cosmetics.

The reported prevalence of eyelid dermatitis varies widely, ranging from 3% to 21% (1, 2). Eyelid dermatitis can be caused by a variety of factors, as eyelids are exposed to airborne irritants or allergens, and are also the sites of

contact with many cosmetics. We report 2 patients with eyelid dermatitis who showed positive reactions to cobalt chloride and whose own colour cosmetics contained this metal.

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Conflicts of interest: The authors declare no conflict of interests.
Funding sources: None.

Case Report

Patient 1

A 52-year-old woman presented with a 5–6-month history of periorbital dermatitis. Physical examination

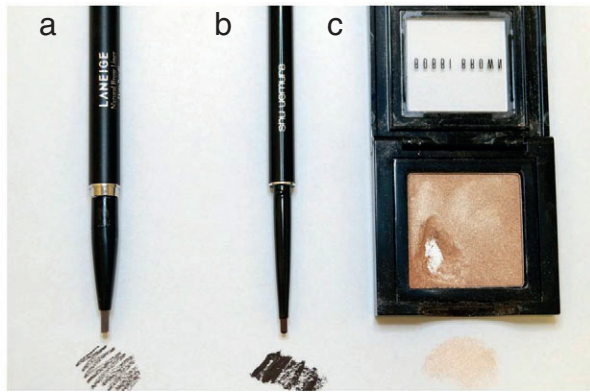


Fig. 1. Cosmetics causing eyelid dermatitis. (a) LANEIGE® brow liner. (b) Shu Uemura® brown eyeliner. (c) Bobbi Brown® metallic eye shadow.

Table 1. Metal concentrations in patients' eye cosmetics

Cosmetic	Co (mg/kg)	Cr (mg/kg)	Ni (mg/kg)
1	76.9	ND	ND
2	6.83	12.96	5.59
3	120.46	34.31	21.79

1: LANEIGE® brow liner. 2: Shu Uemura® brown eyeliner. 3: Bobbi Brown® metallic eye shadow.

ND, non-detectable.

Limit of detection of inductively coupled plasma mass spectrometry (X series; Thermo Fisher Scientific, Darmstadt, Germany): Co 0.02 ng/ml, Cr 0.05 ng/ml, Ni 0.05 ng/ml.

showed erythematous pruritic patches, which started from the eyebrows and spread to the forehead. The patient denied using eye drops or hair-dyeing products. A patch test was performed with TRUE Test® (Smart-Practice, Hillerød, Denmark), and this showed positive reactions to nickel sulfate and cobalt chloride on days 2 and 4. The patient mentioned using an eyebrow cosmetic product, LANEIGE® brow liner (Laneige, Seoul, Republic of Korea) (Fig. 1a). The metal content of the brow liner was analysed with inductively coupled plasma mass spectrometry, which showed significant amounts of cobalt (76.9 ppm) (Table 1).

Patient 2

A 40-year-old woman consulted because of recurrent eyelid dermatitis over the course of 1 year. Physical examination showed pruritic erythematous patches on both upper eyelids. The patient denied using eye drops or hair-dyeing products, and had no history of metal allergy. A TRUE Test® patch test yielded positive reactions to neomycin sulfate, potassium dichromate,

cobalt chloride and paraben mix on days 2 and 4. After explicit questioning, the patient mentioned using two eye cosmetic products, Bobbi Brown® metallic eye shadow (Bobbi Brown, New York, USA) and Shu Uemura® brown eyeliner (Shu Uemura, Tokyo, Japan), before the development of skin symptoms (Fig. 1b,c). Both products were free of parabens, but the Bobbi Brown® eye shadow contained the pigments Green 17 (CI 77288) and Green 18 (CI 77289), which are chromium oxide and chromium hydroxide, respectively. The analysis of the metal contents showed concentrations given in Table 1. Chromium and cobalt in eye cosmetic products were thus suspected to be the relevant allergens.

Discussion

All pigmented makeup products may contain metals. Metals can be included in these products intentionally as cosmetic colorants, or unintentionally in the form of impurities (3, 4).

According to EU Regulation No. 1223/2009/CE, it is acceptable for cosmetics to contain 'technically unavoidable traces' of metals, but there is no regulation regarding the amounts of nickel, cobalt, or chromium. It has been proposed that the levels of nickel or cobalt should not exceed 5 ppm, and should preferably be below 1 ppm. However, when Sainio et al. (6) analysed eye shadows, the highest level of cobalt was 41 ppm, and only ~25% of products contained < 1 ppm of the metal.

Few cases of cobalt-induced contact dermatitis arising from the use of cosmetic products such as nail gel and massage cream have been reported (6, 7). To the best of our knowledge, there have been no case reports of cobalt allergy associated with eye cosmetic products.

Toxicology and dermatology articles have recently reported the quantitative analysis of the various metal components contained in cosmetic products (5, 8, 9). It has been reported that ED10 values of aqueous cobalt chloride ranged between 0.0663 and 1.95 µg cobalt/cm², corresponding to 30.8–259 ppm (10). When the metal doses applied on the eyelids were calculated, these were found to be 0.0961 and 0.1 µg/cm² for LANEIGE® brow liner and Bobbi Brown® metallic eye shadow, respectively (Table 2). We report 2 patients with eyelid dermatitis who showed positive reactions to cobalt chloride, and whose own colour cosmetics contained the relevant metals. Therefore, dermatologists must not only comprehensively investigate the use of colour cosmetics in patients with periorbital dermatitis and metal allergy, but also educate patients regarding the potential for metals in colour cosmetics to avoid future relapses.

Table 2. Cobalt dose applied on the eyelids

Cosmetic	Concentration ($\mu\text{g/g}$)	Frequency (events/day)	Amount ¹¹ (g/event)	Surface area ¹² (cm^2)	Dose ($\mu\text{g/cm}^2$)
1	76.9	2	0.01*	16 [†]	0.0961
2	6.83	2	0.0025	3.2	0.0107
3	120.46	2	0.01	24	0.1

1: LANEIGE® brow liner. 2: Shu Uemura® brown eyeliner. 3: Bobbi Brown® metallic eye shadow.

Applied metal dose: concentration $\times$ frequency $\times$ amount/surface area.

*We used the amount (g/event) of eyeshadow for the brow liner, as there are no references to the amount of brow liner used.

[†]The brow liner was used to colour the entire eyebrow of the patient.

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