

LETTER TO THE EDITOR

Anaphylaxis due to carmine-containing foods induced by epicutaneous sensitization to red eye-liner

Dear Editor,

Carmine, also called cochineal, is a brightly red-colored pigment from *Dactylopius coccus*. Carmine is used as a dye in various foods and cosmetics.^{1,2} Recently, allergic reactions due to carmine-containing foods have been reported. However, in almost all of these cases, the primary sensitizers have not been identified.

A 40-year-old woman had experienced itching and swelling of her eyelids immediately after applying a dark red eye-liner or orange eye-shadow to her eyelids for 3 years. One year prior, she had developed itching, swelling and redness on her whole body 1 h after eating a pink-colored macaron purchased in Turkey. Later, she experienced itching, swelling and redness on her face, especially eyelids, and body accompanied by pharyngeal tingling and collapse at approximately 15 min after eating chocolate biscuits (Tim Tam, raspberry and white chocolate flavor; Arnott's Biscuits, Sydney, NSW, Australia) or drinking strawberry-flavored latte (Pokka, Nagoya, Japan). Her medical history comprised pollinosis.

The patient had negative results for specific immunoglobulin E for wheat, gluten, ω -5 gliadin, milk and using the ImmunoCAP[®] test (Thermo Fisher Scientific, Waltham, MA, USA). Skin-prick tests (SPT) with dark red eye-liner, orange eye-shadow, chocolate biscuits and strawberry-flavored latte were positive (Fig. 1A). In addition, SPT with carmine (0.1% [w/v]; Wako Pure Chemical Industries, Richmond, VA, USA) was positive. In SPT with the components of orange eye-shadow, only carmine was positive. Furthermore, in basophil activation tests (BAT) using an Allergenicity Kit (Beckman Coulter, Fullerton, CA, USA),³ whole-blood BAT showed 81.1% CD203c-positive cells at a carmine extract concentration of 10 μ g/mL, indicating that the carmine extract enhanced basophil CD203c expression (Fig. 1B). Due to the severity of the patient's anaphylactic reaction, she did not consent to further challenges with foods containing carmine. In the present case, carmine in dark red eye-liner was identified as the primary sensitizer via skin, and consequently allergic reactions would develop after ingesting carmine-containing foods.

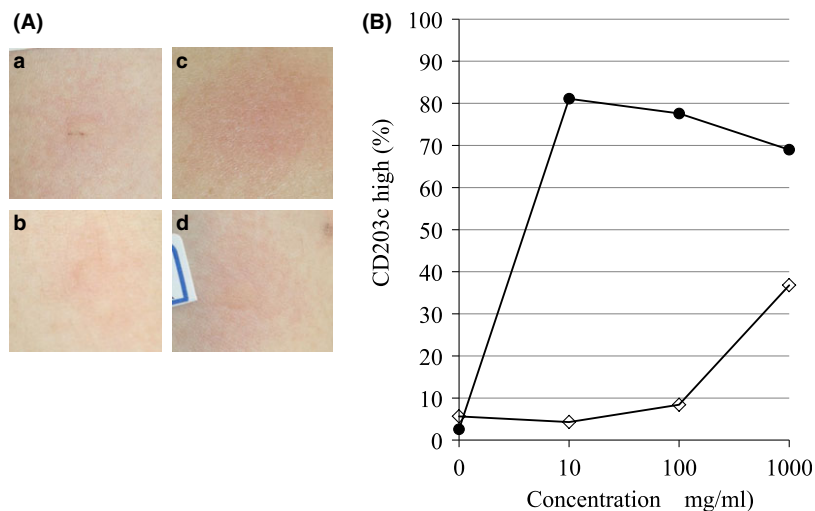


Figure 1. (A) Results of skin-prick tests with carmine-containing products and carmine. Skin-prick tests with the (a) red eye-liner (mean diameter of wheal, 5.0 mm), (b) orange eye-shadow (4.3 mm), (c) carmine in the orange eye-shadow (3.9 mm) and (d) chocolate biscuits (7.7 mm) were positive. (B) The results of basophil activation tests with carmine. Peripheral blood mononuclear cells from the patient (closed circles) and two healthy control subjects without carmine allergy symptoms (open diamonds and closed diamonds) were incubated with carmine for 60 min. CD203c-expressing basophils were detected using flow cytometry. Positive controls (anti-immunoglobulin E) showed 65.4%, 36.0% and 68.4% CD203c-expressing cells in the patient and two controls, respectively.

In 1994, Kagi *et al.*¹ reported the first case of anaphylactic reactions after drinking the alcoholic cocktail Campari Orange. Since then, red-colored beverages and foods have been reported as the causative sources in food allergies due to carmine.^{1,2} In several reports, cosmetic products including lipstick and eye-shadow have been suspected to be sensitizers via skin.^{1,4} However, cosmetics were identified as sensitizers based on a positive SPT in only one case.¹ In the present study, SPT showed positive results with not only the carmine-containing eye-liner but also carmine alone. BAT also showed positive results with the carmine extract. Accordingly, our results supported the hypothesis of epicutaneous sensitization to carmine by cosmetics.

A previous study suggested that the candidate allergen of carmine allergy is not carmic acid but rather a protein with a molecular weight of 38 kDa.⁵ We suspected that she was sensitized to cochineal through the impaired eyelid skin by applying eyeliner and eye-shadows because she had pollinosis.

In carmine allergy, the possibility of not only sensitization to carmine-containing foods via the gastrointestinal route but also epicutaneous sensitization to carmine-containing cosmetics should be considered.^{1,2,4}

CONFLICT OF INTEREST: None declared.

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