

Immunoglobulin E antibodies against a reactive dye — A case report

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HAGMAR L, WELINDER H, DAHLQUIST I. Immunoglobulin E antibodies against a reactive dye — A case report. *Scand J Work Environ Health* 12 (1986) 221–222. The presence of specific IgE (immunoglobulin E) antibodies against a conjugate between human serum albumin and a reactive azo dye (Levafix Goldgelb E-3GA, Reactive Orange 67) was demonstrated by the radioallergosorbent test (RAST), RAST inhibition, and skin prick tests in an occupationally exposed subject with symptoms of mainly rhinoconjunctivitis.

Key terms: conjunctivitis, RAST, RAST inhibition, rhinitis, skin prick testing, specific IgE antibodies.

Reactive dyes have been used in the textile industry for 30 years. It is well known that they can induce contact allergy and elicit allergic contact dermatitis (3). As the dyes are handled in powder form, there is, however, also a risk of inhalation of the dye stuff. In a previous study, four cases of allergic rhinitis and asthma were associated with occupational exposure to four different reactive dyes (1). It was possible to detect specific immunoglobulin E (IgE) antibodies against three of these dyes. In the present communication we report a case of type-I allergic sensitization against another reactive dye.

Case history

The patient was a 26-year-old woman, a nonsmoker, who had never previously suffered from any symptoms of atopy. However, both her mother and a sister suffered from allergic asthma. She was employed in 1977 in a textile factory, but not exposed to reactive dyes until March 1984, when she was transferred to the color kitchen, where she weighed out small amounts of different reactive dyes in powder form. Within a month she developed immediate symptoms of rhinoconjunctivitis when weighing out Levafix dyes (Bayer, Leverkusen, Federal Republic of Germany). These symptoms became increasingly intense. About a year later she was heavily exposed to one of the 16 Levafix dyes — Goldgelb E-3GA, Reactive Orange 67 (5) — accidentally and experienced, in addition to rhinoconjunctivitis, immediate symptoms of asthma.

A physical examination in May 1985 showed no rhonchi during chest auscultation. The serum IgE [Pharmacia PRIST (paper radioimmunosorbent test)]

value (82 kU/l) was within the normal range. Skin prick testing with 14 common allergens (Allergologisk Laboratorium, Copenhagen) showed, however, a positive reaction to house dust. An epicutaneous patch test with 18 textile dyestuffs showed a positive reaction to Goldgelb E-3GA, but not to the other dyes tested.

Skin prick testing was performed with all of the 16 Levafix dyes to which the subject was occupationally exposed. Two milligrams of each dye was dissolved in 1 ml of 0.9 % saline. The skin reaction (weal) against the positive control, 1 mg of histamine chloride/ml, was classified as + + + (8). The patient developed an immediate, clear-cut (+ + + +) skin reaction to Goldgelb E-3GA, but not to any of the other 15 Levafix dyes. No skin reaction could be elicited from five reference subjects.

Antigen for the RAST (radioallergosorbent test) was prepared by adding 6 mg of Goldgelb E-3GA to 30 mg of human serum albumin (HSA) (Kabi-Vitrum, Stockholm) in 10 ml of 0.1 M sodium hydrogen carbonate (pH 6.8). The solution was heated at 40°C for 2 h. The protein was purified from unreacted dye by dialysis (Minicon-B concentrator, Amicon Corporation, Danvers, Massachusetts, United States). About 0.08 mg of dye/mg of HSA was bound according to a spectrophotometric analysis, on the assumption of no change in the absorbance by the binding of dye to HSA. This calculation is very approximate, as it was necessary to use a technical compound for the synthesis.

The dye-protein conjugate (3 mg/ml) was bound to cyanogen bromide-activated filter paper discs (2) for use in a RAST. We employed the Phadebas RAST system (Pharmacia Diagnostics AB, Uppsala, Sweden), using 50 µl of serum and 50 µl of anti-IgE ¹²⁵I solution. The RAST ratio (counts per minute obtained from the antigen disc divided by the results from an HSA disc) was 27 for the patient and in the range of 1.0–1.9 (arithmetic mean 1.4) for seven reference subjects.

Fifty microliters of serum from the patient was

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diluted with 50 μ l of RAST buffer solution and incubated at about 22°C for 3 h with 50 μ l of different concentrations of the antigen (0.96—3 000 μ g/ml). The addition of 150 μ g of the antigen inhibited the RAST binding by 97 %. Fifty percent inhibition was reached by the addition of 1.2 μ g of the antigen. Incubation of the serum with 150 μ g of HSA had no effect on the RAST binding.

Discussion

Reactive dyes have reactive groups, forming covalent bonds with textiles, for example with cellulose fibers in cotton. As the dyes readily bind to hydroxyl or amino groups, they have the ability to react with, for example, proteins in the airway mucosa. Thus, reactive dyes, as well as other low molecular-weight compounds such as isocyanates and acid anhydrides, may act as haptens (4, 7).

The sensitizing properties of different types of reactive dyes are not well known. In a previous case report four other dyes were associated with type-I allergy (1), and according to preliminary results a fifth dye-stuff was related to asthma in three out of ten exposed workers (6). In this study we have demonstrated the presence of specific IgE antibodies against a sixth reactive dye, Levafix Goldgelb E-3GA.

The clinical picture and the RAST and skin prick test results suggest a type I reaction. It is remarkable that, in addition, there was a positive epicutaneous test reaction, which indicates a type IV allergy, although the subject had no dermatitis.

There is a need both for further surveys of workers exposed to other reactive dyes and for careful preventive measures in the handling of such compounds.

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