

Case report

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Occupational allergic rhinitis and contact urticaria caused by bishop's weed (*Ammi majus*)

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Bishop's weed (*Ammi majus*) has been known to induce toxic phytophotodermatitis. We now describe IgE-mediated rhinitis and contact urticaria caused by exposure to bishop's weed in a 31-year-old atopic female florist. A skin prick-prick test with bishop's weed flowers gave an 8-mm wheal, and the bishop's weed-specific IgE level in the patient's serum was 9.7 PRU/ml (RAST class 3). In an immunoblotting experiment with the patient's serum, nine IgE-binding protein bands with the molecular weights 19, 34, 39–41 (doublet), 52–61 (doublet), and >67 (triplet) kDa were detected in bishop's weed extract. The patient became symptomless after she had ceased to work as a florist.

The plant family Umbelliferae includes species liable to cause phytophotodermatitis. Bishop's weed (Queen Anne's lace, *Ammi majus*, Fig. 1) has been known for centuries to have this property. Its juice contains psoralens, currently well known for their usefulness in the phototherapy of vitiligo and psoriasis. Bishop's weed has also been used for decorative purposes in bouquets of flowers. Our patient, a florist who handled bishop's weed, appeared to suffer allergic rhinitis and contact urticaria caused by this plant.

Case report

The patient was a 31-year-old female florist. At the age of 23–25 years, she had worked as cabin hostess on a ship and suffered occasionally from rhinitis and conjunctivitis. Skin prick tests were carried out to detect the cause; she had a weak positive reaction to timothy grass pollen and a stronger reaction to feathers. For the next 2 years, she studied to

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Figure 1. Bishop's weed (*Ammi majus*).

become a florist and had no symptoms of allergic rhinitis. For 5 years, she worked as a florist, and for the last 2 years she suffered from severe rhinitis. She also had urticarial lesions of a few hours' duration on her hands induced by contact with flowers. Occasionally, she had shortness of breath and wheezing. The symptoms appeared immediately and were more severe early in the week, when she handled large amounts of flowers. Her rhinitis was treated with fluticasone propionate, but this was of no help when she handled bishop's weed, chrysanthemums, and milfoil (*Achillea millefolium*).

After our study, the patient ceased working as a florist and has since been symptomless for over a year.

Skin tests

Skin prick tests were performed with a standard series of common inhalant allergens (Soluprick 10 HEP, ALK, Hørsholm, Denmark) and with latex (Stallergènes SA, Antony Cedex, France). The prick-prick method (1) was

used for skin tests with fresh fruits, vegetables, nuts, spices, seven common green indoor plants, and flowers suspected to induce her symptoms. In all skin tests, histamine dihydrochloride (10 mg/ml) was used as a positive and physiologic saline as a negative control. The largest wheal diameter was measured, and the reaction was considered positive if the diameter was ≥ 3 mm over the negative control. All skin tests were read at 15 min. Four atopic and six nonatopic persons served as controls.

In our patient, the histamine wheal was 6 mm and the saline wheal 2 mm. Weak dermographism disturbed to some extent the reading of skin tests. In prick tests, birch, timothy, meadow fescue, and mugwort pollen all gave 4-mm reactions, which were considered negative. In prick-prick tests with vegetables, celery gave a 6-mm reaction and parsnip a 5-mm reaction. No positive test results were given by green plants (wheal < 5 mm). In prick-prick tests with flowers the patient had been handling, milfoil gave a 9-mm reaction, bishop's weed an 8-mm reaction, and chrysanthemum a 5-mm reaction, all regarded as positive. The positive reactions were obtained with the flowers proper; stalks and leaves gave minor reactions. None of our atopic or nonatopic control persons had positive reactions to the flowers.

Nasal challenge tests

Initially, nasal, ocular, and pharyngeal status was recorded. Posterior rhinomanometry using Mercury Rhinomanometer no. 6 (Mercury Electronics, UK) was performed, and the nasal resistance was calculated from the flow at a gradient pressure of 75 Pa. The patient then sniffed a flower for 10 min. If no reaction was noticed, the procedure was continued. As a control challenge, small pieces of absorbent cotton soaked in physiologic saline were placed in both cavities on the mucosa at the anterior end of the lower turbinate. After 10 min, the cotton pieces were removed; then, nasal, ocular, and pharyngeal status was re-evaluated, and rhinomanometry was repeated. An extract of all parts of the plant (stalks, leaves, and flowers) to be tested was prepared in physiologic saline solution. New pieces of absorbent cotton were soaked in the plant extract and placed in the nasal cavities. The cotton pieces were removed after 10 min, and the clinical evaluation and rhinomanometry measurements were repeated immediately and 30 min after the allergen challenge.

Sniffing bishop's weed flowers and handling the plant caused conjunctival redness, pronounced nasal secretion, and moderate conchal swelling on the right side of the patient's nose. The nasal resistance was +50% at 30 min. An

increase of 50% or more in nasal resistance was considered positive. Chrysanthemum and milfoil produced only slightly increased secretion, and the changes in nasal resistance at 30 min were +22% and -8%, respectively.

Lung-function tests

Flow-volume spirometry (FVC 105% and FEV₁ 109% of predicted values) and the bronchial histamine challenge test (PD₁₅ >1.60 mg) were normal.

Detection of specific IgE

The immunospot method was used to detect serum IgE antibodies to bishop's weed and milfoil; to 15 other flowers (1:3 to 1:5 w/v extracts) commonly handled by florists; and to birch, timothy, mugwort, and dandelion pollens (Solu-prick extracts, ALK, Hørsholm, Denmark) (2). Serum from a nonatopic person and pooled sera from atopic (mugwort-sensitive) patients were used as controls.

Distinct binding of the patient's serum IgE antibodies was demonstrated only to bishop's weed. Much less binding occurred to freesia, gypsophila, hyacinth, gerbera, lily, carnation, and tulip. Faint binding was demonstrated also to timothy pollen (RAST 0.4 PRU/ml, Pharmacia & Upjohn), but not to other pollens. No binding of IgE from the nonatopic person's serum to any plant samples could be observed. From the atopic pool, serum IgE was bound to chrysanthemum and tulip, and to mugwort and dandelion pollens, but not to bishop's weed.

To quantitate specific IgE to bishop's weed and to milfoil, extracts were first made by an overnight incubation of flowers and stalks in 0.1 mol/l potassium phosphate buffer, pH 7.4. The total protein content of the extract was 0.4 g/l for bishop's weed and 0.9 g/l for milfoil, as measured by the Bradford method (Bio-Rad Laboratories, Richmond, CA, USA). RAST disks were prepared and the RAST was performed as described by Ceska & Lundkvist (3). Amounts of 1 µg of bishop's weed and 2 µg of milfoil proteins were coupled per disk. Phadebas RAST reagents (Pharmacia & Upjohn) were used in the assay. Specific IgE levels above 0.35 PRU/ml were considered positive. Fourteen individual sera (four birch-, six timothy-, and four mugwort-pollen-positive sera) were used as atopic controls. A pool of sera from 20 nonatopic subjects (serum total IgE less than 20 kU/l) served as a negative control.

The patient's specific IgE to bishop's weed, 9.7 PRU/ml (RAST class 3), was high, while the result for milfoil, <0.35 PRU/ml, was negative. From the nonatopic serum pool and

the atopic sera, no binding of IgE to bishop's weed or milfoil was observed with the exception that IgE from the mugwort-positive control serum was positive to milfoil.

Bishop's weed was selected for immunoblotting. A reduced extract (30 µg protein in 150 µl of sample buffer) and molecular weight markers were separated by SDS-PAGE in a 15% gel with a 4% stacking gel, according to Laemmli (4), and blotted to Immobilon-P (Millipore, Bedford, MA, USA) for protein staining with Coomassie brilliant blue and to nitrocellulose (Bio-Rad) for immunoblotting, according to Towbin et al. (5). IgE bound from the patient's serum (diluted 1:2) was detected with radiolabeled anti-IgE (Pharmacia & Upjohn), as described previously (6). Sera from one nonatopic and one atopic patient (dog RAST 21 kU/l) were used as controls.

Protein staining after SDS-PAGE showed very faint bands in the range of 14–30 kDa (not shown). After immunoblotting, distinct IgE binding was demonstrated to at least nine bands (Fig. 2). The most intensive bands were at molecular weights 19, 34, 39–41 (doublet), 52–61 (doublet), and >67 kDa (triplet). No binding was observed with normal or atopic control sera.

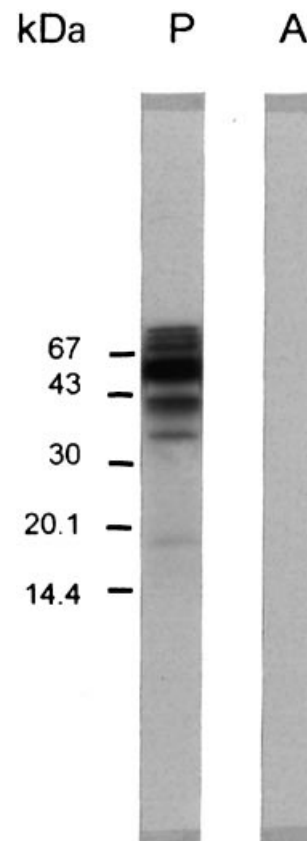


Figure 2. Immunoblot analysis of binding of IgE antibodies from patient's serum (P) and from atopic control serum (A) to proteins in extract of bishop's weed. MW markers (kDa) on left.

Other *in vitro* tests

The patient had an elevated total serum IgE of 1032 kU/l (reference range <110 kU/l). The serum ECP was 8.8 µg/l, which is normal (reference range 1.8–18 µg/l, Pharmacia & Upjohn method, Uppsala, Sweden).

Discussion

Our patient was shown to be allergic to bishop's weed. Bishop's weed (*Ammi majus*), together with many important vegetables and herbs, belongs to the Umbelliferae family. Some of the members of this family (e.g., celery, parsnip, carrot, dill, and parsley) cause IgE-mediated sensitivity, delayed hypersensitivity, and phototoxic reactions (7). Our patient did not show symptoms to other members of this family, although positive skin test reactions were obtained to celery and parsnip. IgE-mediated allergy to bishop's weed has not previously been described, but cromoglycates derived from its close relative, *A. visnaga*, are known to cause immediate allergic reactions (8).

The milfoil (*Achillea millefolium*) belongs to the Asteraceae family. Several plants in this family are known for their allergenic pollens; e.g., ragweed, mugwort, and chrysanthemum.

Our patient had an elevated serum IgE level and positive skin test reactions to a great number of allergens. She was obviously atopic. In prick-prick tests, she had clearly positive reactions to bishop's weed and to milfoil, and

these plants appeared to be associated with her symptoms at work. She also had a strongly positive nasal challenge test to bishop's weed, and she had a high level of specific IgE to this plant. On the other hand, milfoil did not give a positive challenge result, nor could IgE antibodies to it be demonstrated. Thus, our patient suffered from an obvious allergy to bishop's weed, but her allergy to milfoil remained uncertain.

We are not aware of any allergens that cross-react with bishop's weed. The patient had a weak reactivity to timothy pollen, but none of the six timothy IgE-positive control sera reacted to bishop's weed.

Occupational type I sensitization to decorative flowers is rather rare (9), but not unknown. *Ficus benjamina* (10), spathe flower (11), *Tradescantia* (12), Christmas cactus (13), and dried flowers of *Limonium tataricum* (14) have caused sensitization. Since extracts of flowers are not commonly available for allergy testing, use of mugwort pollen extract has been recommended for screening of flower allergy (15). Our patient showed a faint reactivity to both mugwort pollen and other pollens in skin prick tests. She had a low serum level of IgE against timothy pollen, but not against mugwort pollen.

In summary, we describe an atopic florist with allergic rhinitis and contact urticaria from bishop's weed. She had positive skin prick test and RAST results to bishop's weed. In immunoblotting, nine IgE-binding protein bands were demonstrated in bishop's weed extract. Allergic rhinitis was confirmed by nasal allergen challenge test. We conclude that bishop's weed should be added to the list of flowers capable of causing occupational, IgE-mediated allergy.

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