

Case report

Allergy to pine nuts in a bird fancier

Jansen A, Vermeulen A, Dieges PH, van Toorenenbergen AW. Allergy to pine nuts in a bird fancier.

Allergy 1996; 51: 741–744. © Munksgaard 1996.

A patient is described with the bird-egg syndrome who experienced an anaphylactic reaction after eating some of her parrot's food (pine nuts: *Pinus pinea*). Specific IgE against this nut and another pine nut (*P. cembra*) was demonstrated by RAST. Cross-reactivity between these botanically related seeds was shown by RAST inhibition. Besides avian antigens, bird food antigens should be taken into consideration when symptoms of allergy occur on exposure to birds.

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Key words: anaphylaxis; food allergy; pine nut; piñon; bird-egg syndrome.

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Accepted for publication 7 May 1996

Exposure to avian antigens is a well-known cause of allergic asthma and extrinsic allergic alveolitis (1). Some patients with IgE-mediated respiratory reactions to bird allergens experience symptoms of food allergy after consumption of hen's egg; this combination of symptoms has been termed the bird-egg syndrome (2). Chicken serum albumin, present in egg yolk, has been found to be a cross-reactive structure in the bird-egg syndrome (3–5).

We describe a patient with the bird-egg syndrome who experienced a third bird-related allergy: an IgE-mediated anaphylactic reaction to her parrot's food (*Pinus pinea*).

Case report

On several occasions, a 54-year-old woman had experienced angioedema of lips and tongue immediately after eating hen's egg. Recently, she had developed an itching throat, facial angioedema, inspiratory stridor, generalized urticaria, abdominal cramps, nausea, and vomiting immediately after eating a single nut of her parrot's new brand of food, which later proved to be *P. pinea* seed. She had never before eaten that particular seed.

For some years, she had had perennial complaints of rhinitis and exacerbation of asthma while cleaning her parrot's cage. Chest radiographs were

normal. Spirometry showed a mild obstructive pattern; Tiffeneau index 68% (82% of predicted value) with complete reversibility after salbutamol inhalation. Additional lung function tests (diffusion capacity and capnography) were normal. Precipitating antibodies in her serum against parrot feathers, serum, or feces were absent.

Material and methods

Allergens

P. pinea and *P. cembra* nuts were supplied by the patient, who had obtained these nuts from a local pet store. The botanic identity of both species of nuts was kindly established by Dr A. Farjon (6). Raw peanuts and hazelnuts were obtained from a local grocery. Hen's egg white and yolk were prepared as described previously (7).

Raw nuts were ground in a mortar, defatted by ether extraction, and subsequently air-dried and stored in an exsiccator at room temperature.

For use in skin tests, 0.5 g defatted *P. pinea* nuts was shaken for 1 h at room temperature with 4.5 ml phosphate-buffered saline, pH 7.4, 0.03% human serum albumin, and 0.5% phenol (Aquagen dilution fluid, ALK Benelux, Groningen, The Netherlands). After centrifugation for 10 min at 1400 g, the

supernatant was passed through a 0.22- μ m Millex GS filter (Millipore, Etten Leur, The Netherlands). This 10% (w/v) extract was stored at -20°C . In the same way, a filtered 10% extract was prepared of *P. cembra* nuts. For use in skin tests, these extracts were further diluted with Aquagen dilution fluid.

Intracutaneous tests with common inhalant allergens (*Dermatophagoides pteronyssinus*, grass pollen mixture, tree pollen mixture, weed pollen mixture, epithelia from cats and dogs, bird feather mixture, and various mold spores) were performed with commercial extracts (ALK Benelux). Skin prick tests with food allergens (egg white, egg yolk, peanut, and various nuts) were also performed with commercial extracts (ALK Benelux).

Skin tests

Skin prick tests were performed and graded as described elsewhere (8, 9). In short, skin prick tests were performed by application of one drop of a 1% allergen extract to the volar side of the forearm. Subsequently, the dermis was punctured with an ALK skin test needle (ALK Benelux). Results were read after 15 min. Cutaneous reactions were compared with reactions to histamine dihydrochloride (base) 10 mg/ml as positive control. Reactions were considered to be positive if the wheal diameter was the same or larger than that of the histamine reaction.

Intracutaneous tests were performed with 10-fold dilutions of the filtered 10% piñon extracts. Histamine phosphate (base) 0.01 mg/ml and 0.1 mg/ml was used as positive control. The combined wheal and erythema reactions were expressed as standardized plus signs according to the grading system of Norman (9). A concentration inducing a 1+ reaction was regarded as the skin threshold value.

In order to analyze possible irritative properties of the *Pinea* extracts, three nonallergic persons were also tested with these extracts.

Estimation of total and allergen-specific IgE

Total IgE and allergen-specific IgE titers against inhalant and food allergens were determined with the CAP system (Pharmacia, Uppsala, Sweden).

Specific IgE against *P. pinea* and *P. cembra* was determined by RAST using agarose beads as allergen support (10). Ten milligrams of defatted material was extracted with 2 ml coupling buffer (0.1 mol/l NaHCO_3 and 0.5 mol/l NaCl , pH 8.5) for 1 h at room temperature. After centrifugation for 10 min at 1400 g, protein in the supernatant was coupled to 100 mg of CNBr-activated Sepharose 4B (Pharmacia) according to the manufacturer's instructions. After three cycles of acid/base washings,

the piñon Sepharose preparation was finally resuspended in 25 ml RAST buffer (0.9% NaCl , 7 mmol/l phosphate, 0.1% NaN_3 , 0.2% Tween 20 and 0.3% bovine serum albumin [Sigma Chemical Co, St Louis, MO, USA], pH 7.4). For each test, 2 mg piñon Sepharose was incubated overnight with 0.05 ml patient serum. After four washes, radio-iodinated rabbit antihuman IgE antibodies (Pharmacia) were added. After overnight incubation and four washes, the percentage of bound radioactivity was measured in a gamma counter (LKB, Bromma, Sweden). The percentage of binding was converted into kU_a/l by the CAP standard curve.

Specific IgE against parrot feathers and parrot serum was determined as described previously (4, 11).

RAST inhibition

An amount of 50 mg of defatted nuts, hen's egg white, or hen's egg yolk was extracted for 2 h in RAST buffer at room temperature. After centrifugation, 0.05 ml of each supernatant was incubated for at least 4 h with 0.05 ml of serum from the patient. Of this mixture, 0.05 ml was added to 0.4 mg of *P. pinea* Sepharose, suspended in 0.1 ml RAST buffer, and incubated overnight at room temperature. The subsequent RAST procedures were followed as described above.

Results

Skin prick tests results with both *Pinea* extracts are shown in Table 1. In three control subjects, these tests were negative. The patient also showed positive skin prick test reactions to hen's egg white and yolk. Her skin reaction to peanut extract was negative.

Intracutaneous tests with diluted *Pinea* extracts were positive in concentrations that elicited no reactions in three healthy controls. In addition, the patient showed a positive intracutaneous test to parrot-feather extract (data not shown). She showed no reactions to the standard inhalation panel.

In all skin tests, the negative control solution (Aquagen dilution fluid) elicited no reactions.

Specific IgE against *P. pinea* and *P. cembra* was demonstrated by RAST in the patient's serum (Table 2). Four sera with total IgE levels of 64, 192, 221, and 1045 kU/l , respectively, were negative ($<0.35 \text{ kU}_a/\text{l}$) in the *P. pinea* RAST. Two sera with total IgE levels of 320 and 1045 kU/l , respectively, were negative in the *P. cembra* RAST. In the patient's serum, specific IgE against parrot feathers, parrot serum, hen's egg white, and hen's egg yolk was found. Specific IgE against peanut could not be detected in her serum.

Table 1. Results of skin tests with piñon extracts in patient allergic to pine nuts

Skin prick test	
1% <i>P. pinea</i> extract	7 mm
1% <i>P. cembra</i> extract	6 mm
Intracutaneous tests with <i>P. pinea</i> extract	
0.0001%	—
0.001%	—
0.01%	+
0.1%	++
Intracutaneous tests with <i>P. cembra</i> extract	
0.0001%	—
0.001%	+
0.01%	++
0.1%	nt

Skin prick test mean wheal reactions are graded in mm.

Intracutaneous test results are expressed as standardized + signs.

nt = not tested.

Table 2. RAST results of patient allergic to pine nuts

<i>P. pinea</i>	44.6 kU _a /l
<i>P. cembra</i>	18.3 kU _a /l
Parrot feather	9.9 kU _a /l
Parrot serum	11.8 kU _a /l
Egg white	1.6 kU _a /l
Egg yolk	3.7 kU _a /l
Total IgE	184 kU/l

With the patient's serum, the extent of cross-reactivity between both *Pinea* extracts was further investigated by RAST inhibition.

Fig. 1 shows that *P. cembra* nuts inhibited the IgE binding to *P. pinea* nuts; peanut, hazelnut, egg white, and egg yolk had no such inhibitory capacity.

Discussion

The medical history of this patient revealed that in the past years her parrot's brand of food had always been the same, containing peanuts and *P. cembra* seeds. This patient sometimes would eat a few nuts of her parrot's food. This may have been the route of primary sensitization to *P. cembra*. Inhalation of small *P. cembra* particles present in dust from the parrot's cage could also have induced sensitization. A similar route of sensitization was recently suggested for a few cases of allergy to sunflower seed (12). *P. pinea* and *P. cembra* both belong to the botanic family of Pinaceae. Therefore, it can be expected that nuts from these trees have common IgE-binding structures.

Immediate food anaphylaxis while eating *P. pinea* nuts for the first time can be explained by cross-reactivity with the botanically related *P. cembra* seeds, as demonstrated by RAST inhibition.

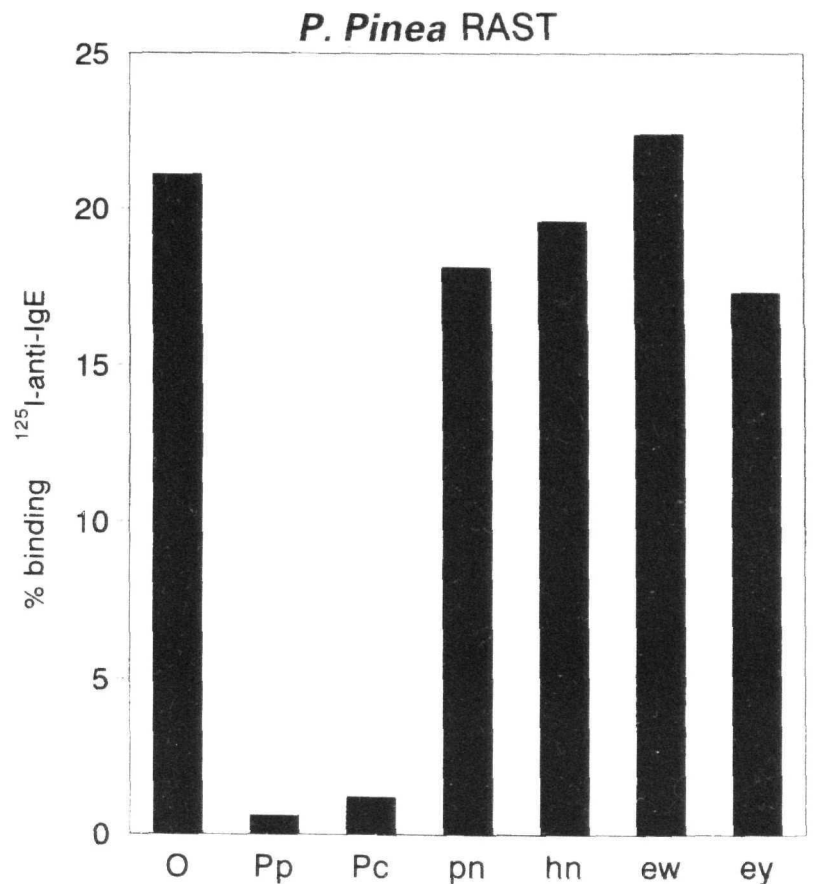


Fig. 1. IgE binding to *P. pinea* Sepharose after preincubation of patient serum with O: RAST buffer and extracts in RAST buffer of Pp: *P. pinea*, Pc: *P. cembra*, pn: peanut, hn: hazelnut, ew: egg white, and ey: egg yolk.

A number of food-allergic reactions to pine nuts have been described (13–17).

The case of this patient not only describes an exotic food allergy, but also suggests that attention to bird food is warranted in bird-related allergic reactions.

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