

Immunologic cross-reactivity between hen's feather and house-dust-mite allergen extracts

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In children with respiratory allergic diseases, we routinely do skin prick tests (SPT) with the most common inhalant allergens. We have found that patients with positive reactions to *Dermatophagoides pteronyssinus* (*Dp*) often also have positive reactions to hen's feather allergen extract. A search of the literature yielded only a few papers on this topic (2, 6, 7). In 1971, Wormald (7) reported that three-quarters of his patients with positive SPT reactions to house-dust mite (*D. farinae*) also reacted to mixed feathers. Using the RAST inhibition method, we found that hen's feather extract contains either mite allergens or allergens which cross-react with *Dp* allergens.

Material and methods

The series comprised 598 consecutive asthmatic children aged 5–15 years referred to the Paediatric Clinic of Oulu University Central Hospital (Oulu, Finland) in 1985–91. They had all been examined clinically by one of us (OL), and SPTs were done on all of them in the Dermatological Clinic of the same hospital with commercial allergens from ALK (Allergologisk Laboratorium, Horsholm, Denmark). The test panel comprised 18 inhalant allergens, including animal danders, pollen, *Dp* (10 HEP/ml), and hen's feathers (1:100 w/v). The test was regarded as positive if the diameter of the wheal elicited by the allergen minus that elicited by the negative control was at least half the size of that of 10 mg/ml histamine dihydrochloride and over 3 mm (3).

In vitro inhibition immunoassay was performed at the Allergen Research Unit of the Departments of Dermatology and Allergic Diseases, Helsinki University Central Hospital (Helsinki, Finland), by the RAST inhibition method (8). The inhibition of *Dp* RAST (Pharmacia, Uppsala, Sweden) by hen's feather extract and several dilutions thereof was measured, and the slope of the inhibition curve was compared with self-inhibition by *Dp* extract (ALK, Soluprick, 10 HEP) (1). Pooled serum from 20 mite-RAST-positive patients was used as a source of IgE antibodies.

The statistical analyses were done with the chi-square test.

Results

Positive SPT reactions to *Dp* were found in 150 subjects (25%) and to hen's feathers in 60 (10%). Eighty percent of the 60 subjects with positive reactions to hen's feathers also had positive reactions to *Dp* (Table 1). The RAST inhibition test demonstrated that the hen's feather extract from ALK could inhibit the *Dp* RAST in a dose-dependent manner, the highest inhibition being 60% (Fig. 1). The slope of the inhibition curve did not differ from the slope produced by self-inhibition with *Dp* extract ($P = 0.65$). The inhibition of *Dp* RAST by hen mite extract itself was not possible, because pure was not available to us.

Table 1. Skin prick test reactions of 598 consecutive asthmatic children to *D. pteronyssinus* and hen's feathers

Reactions to <i>D. pteronyssinus</i>	Reactions to hen's feathers	
	Positive (n = 60)	Negative (n = 538)
Positive	48	102
Negative	12	436

Chi square 107.0; $P < 0.001$.

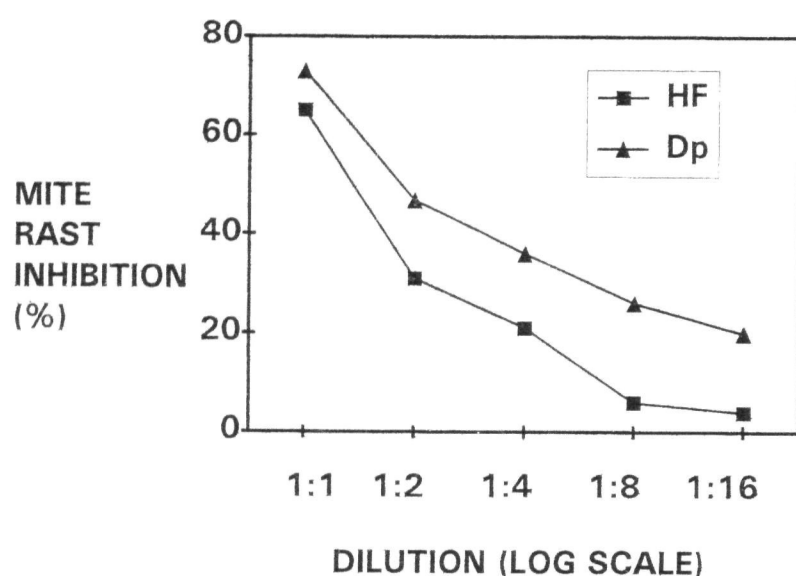


Fig. 1. Mite (*Dp*) RAST inhibition with hen's feather extract (HF) and with *Dp* extract.

Discussion

Synthetic materials have replaced feathers in the bedding in most Finnish homes; a manufacturer estimates that feather-filled pillows and quilts account for less than 5% of the total volume of these items sold. In addition, few children have close contact with living birds. Although house-dust mites are a growing problem in Scandinavia (5), we found positive SPT reactions to *Dp* in only 25% of patients, but to hen's feathers in 10% of patients, 80% of whom also had a positive reaction to *Dp*. None of the last raised any suspicion of feather allergy. It is thus possible that the positive reactions to feather extract were not due to sensitization to feather as such.

Our inhibition results showed an immunologic similarity between the extracts from hen's feathers

and house-dust mite. Although the inhibition may result from cross-reacting allergens in hen's feathers and mites, the more probable explanation is that, because inhibition curves were parallel, the hen's feather extract contains *Dp* allergens or at least allergens with epitopes common to *Dp* allergens. Old feathers in pillows can be contaminated with house-dust mites (2), but the feather allergens used in our tests were derived from unwashed, freshly plucked feathers and had been manufactured either immediately or after storage in a frozen condition (personal communication from ALK).

It is generally known that hens suffer greatly from blood-sucking mites (4), but no information is available on the immunochemical properties of these mites. Wormald (7) suggested that the association of positive SPT reactions with house-dust mites and feathers may be caused by cross allergenicity between house-dust mites and the hen's mites that can contaminate the unwashed feathers. Our results do not entirely refute this view.

We conclude that positive SPT reactions to hen's feathers are partly due to mite allergens in the extract and that an SPT with hen's feathers should be accompanied by a test with *Dp*.

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