

Diagnosis of house dust mite allergy

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In 1964, Voorhorst launched the theory that the most important allergenic part of house dust was constituted by mites of the genus *Dermatophagoides* (21).

Today we know that house dust mite allergy may cause perennial rhinitis and asthma. Sometimes, exacerbation of atopic dermatitis may occur, if the patient suffers from house dust mite allergy and is exposed to this allergen (2, 10-12).

PERENNIAL RHINITIS

Medical history

Although in some patients, symptoms may definitely be related to exposure to house dust, this is not possible in a large group of patients. It is also well known that many non-allergic patients feel sensible to dust and experience symptoms from eyes and nose. In this way, the medical history is rather unreliable (13).

However, the classical symptoms are:

- a) awakening with sneezing and perhaps nasal stuffiness;
- b) exacerbation of symptoms when making the bed;
- c) release of symptoms when in the open.

Patients who are monoallergic to house dust mites often have more frequent nose than eye symptoms (16).

OBJECTIVE EXAMINATION

Inspection of the nose and rhinoscopia anterior should be performed in all patients with peren-

nial rhinitis. The appearance of the nasal mucosa and its histology does not offer much help in discriminating between different allergenic causes of rhinitis. The presence of nasal polypi has not been demonstrated in relation to mite allergy.

DIAGNOSTIC METHODS

Skin prick testing for demonstration of specific IgE in the skin is the first diagnostic measure to be taken. In Denmark, intracutaneous testing is seldom used because of the availability of potent, standardized extract. In Denmark, the majority of the dust mite allergic patients most frequently react to both *Dermatophagoides pteronyssinus* and *Dermatophagoides farinae*, reactions being most pronounced to *D. pteronyssinus*, maybe because of the strength of the extract. In today's standard panel with 10 allergens, testing with both mite extracts is recommended. There is only a minor cross-reactivity between house dust mite and storage mite, for which reason you have to test specifically for storage mite, too, if you suspect the patients to be sensitive to that type of mite. Skin prick testing may be performed according to a "wet" or a "dry" method. For now, for users of the "wet" method, the mite extract in the strength of 10 HEP (Soluprick, Allergologisk Laboratorium, Hørsholm, Denmark) is recommended. The size of a positive skin prick test depends on the type of lancet used. The lancet with 1 mm stylus manufactured by ALK/Pharmacia gives a somewhat larger reaction than that of Dome/Hollister-Stier. The "dry" method by which the allergen is bound to the lancet - Phazet (Pharmacia AB, Uppsala, Sweden) - is supplied with

an extract strength of 100,000 BU/ml for both *D. pteronyssinus* and *D. farinae*. The Phazet prepared with allergen offers a larger skin reaction owing to the higher concentration of the extract. We define a positive skin prick test, by which specific IgE has been demonstrated in the skin, as a reaction giving a median wheal diameter of ≥ 3 mm, or, if planimetry has been performed, an area of ≥ 7 mm². Skin prick testing performed with Soluprick or Phazet is the most sensitive method for demonstration of specific IgE. It is obvious that even though you have demonstrated a sensibilization of the patients, they do not actually have to experience allergic symptoms.

RAST testing (radio-allergo-sorbent test) is used for demonstration of specific IgE in the blood. The most well-documented RAST test is the Phadebas RAST test manufactured by Pharmacia AB, Uppsala, Sweden (8). A new chemiluminescence technique (LIA) = luminescence immunoassay (ALK) employs monoclonal antibodies directed against human IgE. In future, the test will be delivered as a kit called Magic Lite. The documentation for sensitivity and specificity of this test has not yet been published.

Histamine release testing, by which histamine release can be measured after allergenic stimulation of the blood cells, has become of more current interest after the development of a micromethod not requiring separation of the blood cells. Heparinized blood should be analysed within 24 hours. The sensitivity and specificity of the test lie between skin prick test and RAST (own data). It should be added that approx. 7% of all test persons do not react to this analysis, as they do not release histamine from their basophil leukocytes, if anti-IgE is added (non-responders) (19).

CLA/MAST = multiple chemiluminescence allergosorbent test system is a method allowing measurement of specific IgE and total IgE in serum. The method has the capacity to test up to 36 allergens in 1 serum sample (4). The test offers a fairly good conformity with the RAST analysis, but a bad conformity with the skin

prick test. Until further, the test can be ordered through Medicinsk Laboratorium.

Nasal and conjunctival allergen challenge testing may be performed if the other diagnostic tests have been incapable of unmistakably demonstrating whether the patient is mite-allergic or not. Measurement of unspecific hyperreactivity in the nose with histamine or methacholine could be used in connection with monitoring of e.g. hyposensitization, but the diagnostic value of this test method remains uncertain. If the patient undergoes all diagnostic tests, including allergen challenges, x-ray of the sinus will of course have been considered and maybe performed. Further, a collection of house dust from the patient's bed will probably have been examined to see whether the patient is exposed to house dust mite allergen.

ASTHMA

Medical history

Even though the number of living mites is increased during and after the hot, humid season, most house dust mite-allergic people have more symptoms in the cold months to follow (14, 16), because some of the mites disintegrate and their faeces are still in the beds. Moreover, at this time of the year most people are more constantly indoors. Exacerbation of the symptoms often takes place at night, when the patients are in bed (20, 22) and the mite exposure is maximal; it is not in all mite-allergic patients that this pattern can be seen, because many of them are relatively well treated with e.g. local steroids, so that no symptoms will be present. Bronchoconstriction at night is a general phenomenon in asthmatic patients, also in those who are not house dust mite-allergic (1). Measurement of the lung function with peak flow meter in the morning and evening should always be performed for at least a fortnight in connection with monitoring of symptoms.

DIAGNOSTIC METHODS

Sensibilization towards house dust mite allergen can be determined similarly to allergic, peren-

nial rhinitis. Skin prick test, RAST test, or histamine release test may be performed.

Bronchial challenge is used to elucidate the sensitivity of the airways to unspecific and specific stimuli. Bronchial hyperreactivity can be found in most asthmatics and is defined as an increased sensitivity of the airways as a response to a standardized stimulus in relation to the response of a normal population. Determination of specific and unspecific bronchial reactivity can be used diagnostically (6, 9). If you want to compare results of bronchial challenge tests, standardized methods are mandatory, because many factors influence the results. If you are testing for unspecific hyperreactivity, all persons are known to react to this test, if the stimulus (dose) is adequately large. If a bronchial challenge test is made with house dust mite allergen, specific bronchial reactivity is only found in patients sensitized to e.g. this allergen.

Even though the allergen amount and particle size at a bronchial allergen challenge test do not correspond to the natural exposure, this test is the best diagnostic measure when examining for house dust mite asthma. Already in 1972 (3) immediate and late reactions after allergen challenge testing in the bronchi with *D. pteronyssinus* were reported. In 1976, late reactions were reported to occur in a great many mite-allergic children with asthma (23). Cartier and Cockcroft (5) showed that patients with both immediate and late reactions after allergen challenge testing have an increased unspecific hyperreactivity after the challenge. We know today that challenge with *D. pteronyssinus* may cause production of both leukotrienes and eosinophil cell products in bronchial lavage fluid, and that these mediators may very well be involved in the formation of the inflammatory condition of the lungs (7, 15).

ATOPIC DERMATITIS

In recent years, there has been a renewed interest about the role of allergens in atopic dermatitis (10–12). Besides IgE and IgG antibodies against house dust mite allergens, many patients with atopic dermatitis also have circulat-

ing mite-specific T-cells (18). Moreover, the mite allergen may induce a delayed eczematous skin reaction (10). By patch-testing, the response to Der p I is dominated by cell infiltration of eosinophil and basophil cells in the dermis (11, 12). Controlled studies with avoidance of mite allergen in patients with atopic dermatitis have not yet been conducted, but the clinical response of hospitalization offers promising results (17)

TESTS IN STORAGE MITE ALLERGY

Storage mites dwell in stored grain, hay, and straw, feeding on the microscopic moulds. In comparison with house dust mites, the storage mites require a much higher humidity, and it has been shown that, consequently, larger amounts of storage mites are to be found only in very damp dwellings. However, the storage mites do in fact constitute approx. 15–20% of the mite fauna of the house dust. Allergy to storage mites may give symptoms from both eyes, nose, and lungs. There is only a minor cross-reactivity between house dust mites and storage mites, and it may therefore be useful to perform diagnostic testing for storage mite. Unfortunately, today there are no optimally standardized extracts for skin prick testing. The storage mite panel consists of 3 storage mites, *Acarus siro*, *Lepidoglyphus destructor* and *Tyrophagus putrescentiae* in the concentrations 100, 1,000, and 10,000 noon equivalent/ml (Diephuis, Groningen, The Netherlands). Specific antibodies to storage mites can be demonstrated in blood by Phadebas RAST (Pharmacia), LIA test or Magic Lite (ALK).

SUMMARY

The medical history may be conclusively descriptive in house dust mite allergy in patients with asthma and rhinoconjunctivitis. Often the patients have both diseases. Sensibilization to *D. pteronyssinus* and *D. farinae* can be demonstrated by skin prick testing. If the diagnosis is still doubtful, the next step will be to perform a RAST test or a histamine release test. It is also important to investigate for mite exposure at the

patient's residence, if the patient is suspected to be mite-allergic. Allergen challenge test in the shock organ should be performed, if hyposensitization is considered, or if, in a few cases, the mite diagnosis is still doubtful.

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