

Miller moth asthma

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Summary

The characteristics of the allergen producing asthma caused by inhaled miller moth particles were investigated by skin testing and by Sephadex fractionation. No major difference in skin test reactivity was found between the wings and the bodies of the moths. Two fractions of the moth extracts were found to contain allergic reactivity. The importance of detailed history-taking in order to discover such causes of asthma is stressed.

Introduction

The allergic triggering factors in patients with asthma are usually defined fairly easily by correlating historical information with the results of skin testing. Occasionally, the asthmatic with a seasonal history shows no reaction to the commonly used inhalant skin test extracts. In situations such as these, unusual causes of asthma must be searched for, and miller moth inhalant asthma is one of these. Two patients with this problem were studied; miller moth extracts were evaluated for allergenic activity.

Case reports

S.R., a white boy, was referred for evaluation when he was 11 years old. He had a 4-year history of seasonal coughing, wheezing, and shortness of breath; these symptoms began in late May and lasted through June of each year. He had previously been treated with theophylline, ephedrine, and corticosteroids, but even this combination of medications failed to control his symptoms adequately. The review of systems, past medical history, and family history were non-contributory and there was no history of rhinitis, conjunctivitis, or other allergic symptoms. Physical examination in June revealed wheezing in all lung fields. The chest X-ray was normal. Scratch and intradermal skin testing for tree, grass, and weed pollens, dust, and dog showed no significant reactions. At this point in the evaluation, the mother volunteered her opinion that the

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boy's asthma might be related to miller moth, since their farm house was heavily infested with these insects every May and June. Direct skin testing with miller moth extract showed a strongly positive reaction and therefore, serum was drawn for Prausnitz-Küstner testing. These tests are described below. Treatment with sodium cromoglycate prior to and during the expected arrival of the miller moths completely blocked the asthma in subsequent years.

D.C., a 14-year-old white male, was seen for a recurrent history of rhinitis and asthma in May and June each year. His house also was heavily populated with miller moths during this season. Prior treatment with oral medications (presumably bronchodilators) had produced only partial relief of symptoms. Scratch and intradermal skin testing with extracts of tree, grass, and weed pollens, dust, and moulds, and danders showed only slight borderline positive reactions to dust, dog, cat, and Juniper monosperma. These tests did not correlate with his seasonal pattern of symptoms. Miller moth skin tests were strongly positive. The patient was treated with sodium cromoglycate as described with our first patient, and has had complete relief of asthma symptoms. The nasal symptoms were controlled with antihistamines.

Materials and methods

Commercial allergy skin test extracts were obtained from Hollister-Stier laboratories. Scratch tests were performed with 1:20 (w/v) and intradermal tests were done by injecting 0.02 cc of a 1:1000 (w/v) solution. Dead miller moths were collected from the house of S.R. by his family. The wings were removed from the moths; one extract was made from the wings and the other from the moth bodies. This separation was done to attempt to show different antigens in the wing scales as compared with the bodies of the moths.

Prausnitz-Küstner passive transfer testing was performed by transferring serum from patient S.R. to the skin of normal volunteers. VDRL and hepatitis B antigen tests were performed on the serum, and these were negative. Intradermal injections of 0.1 cc were made at various sites on recipients' arms; these sites were then tested by scratch and intradermal techniques, after a waiting period of 48 hr.

The miller moth extract was passed through a Sephadex-DEAE G-100 column (40–120 μ m pore size) with an i.d. of 16 mm and a length of 90 cm (2112 Redirac Fraction Collector—LKB). Aliquots from this column were tested for u.v. absorption at 280 nm and for skin test reactivity by direct and indirect methods. Protein determinations were performed with a total solids meter. Molecular weight estimates of the miller moth fraction were made by passing substances of known molecular weight (mol. wt) through the column: horseradish peroxidase (mol. wt = 24,000), and bovine serum albumin (mol. wt = 68,000).

Results

Initially, an attempt was made to find different reactivity in the wings of the moths as compared to their bodies. This was done by skin testing patient S.R. with these two extracts. The results are shown in Table 1. Both the wings and the bodies showed strongly positive reactions. Four non-atopic control subjects had no reaction to these extracts. Prausnitz-Küstner testing to the moth wing extract and moth body extract is summarized in Table 2. Here we see that the moth wing extract and moth body extracts both react strongly.

Since no difference in reactivity was found between the wings and bodies, fractiona-

Table 1. Intradermal skin tests*

	S.R. Control subjects	
Moth wings (1:1000)	4+	0
Moth bodies (1:1000)	3	0
Histamine (1:100,000)	2	2

* As described by Sheldon *et al.* (1967).

Table 2. Prausnitz-Küstner tests: intradermal reactions*

	D.C. serum	S.R. serum	Control site
Moth wings (1:1000)	8 × 20 mm	15 × 25 mm	0
Moth bodies (1:1000)	6 × 12 mm	7 × 20 mm	0

* First number indicates induration; second erythema.

tion of the extract was undertaken. The moth body extract was passed through a Sephadex G100 column and three fractions (I, II, III) were tested by direct and Prausnitz-Küstner techniques. First, intradermal skin tests were done on nine normal, non-atopic persons (controls); there were no positive reactions. These negative skin test reactions were felt to be important in ruling out possible non-specific reactivity of these extracts. Then these fractions were tested on the two patients. Figure 1 illustrates the results of fractionation with Sephadex and indicates the areas in which reactivity was found by skin testing (direct tests in the two patients + P-K tests on controls). Peak I (mol.wt = 75,000) and Peak II (mol.wt = 44,000) had allergic activity, while Peak III (mol.wt = 37,000) had none. It should be noted that the only fraction with a high protein content (7 gw%) was Peak III.

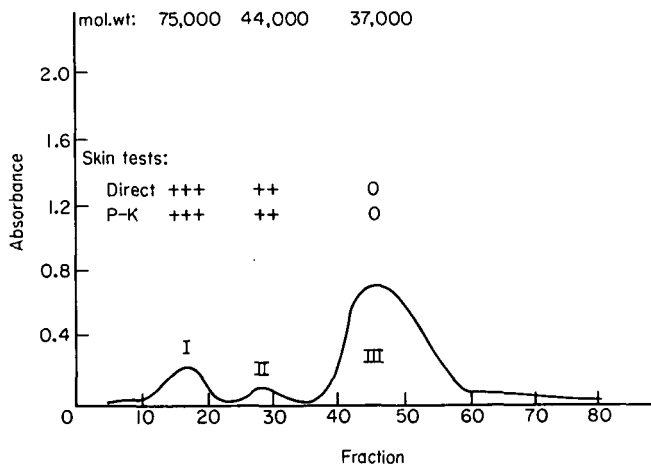


Fig. 1. Results of fractionation with Sephadex showing areas where reactivity was found by skin testing.

Discussion

This miller moth has been identified as *Euxoa auxiliaris* (order Lepidoptera, Family Noctuidae). It is a cutworm moth which is found outdoors in the evening. This and other closely-related species are found all over the world and are common agricultural pests. They are attracted to lights at night and may invade homes in the evening in the spring of the year, and in some rural areas may literally cover the floors and tables. The allergenic substance in these creatures has not been identified specifically, but a variety of proteins have been suggested (Perlman, 1958). The presence of miller moth asthma had been described in the 1930s, 40s and 50s (Vaughan, 1939; Urbach & Gottlieb, 1941; Randolph, 1954). These publications also reported that wing scales from various insects were seen on pollen slides. This was evidence that wing scales and other insect parts were dispersed in the air and could be a cause of inhalant asthma or rhinitis. The two cases described in the present paper support this hypothesis (fractionation technique failed to identify differential reactivity in the moth wings versus the moth bodies). The patients which have been reported on here also illustrate the importance of a very complete medical history and the distinct importance of an environmental and occupational history. The doctor who terminates his evaluation after 'routine' historical data and laboratory tests have been performed will be missing the cause in some of his patients and will be left with unhappy patients who continue to be symptomatic.

A word concerning treatment of this allergy is in order. Prior papers have suggested the use of allergy injection therapy (hyposensitization) in this disease (Perlman, 1958; Hosen, 1970; Shivpuri *et al.*, 1971). Because the data on this type of treatment were fairly old, and the new drugs for asthma were available, it was decided to treat the present patients with sodium cromoglycate. This powder was inhaled four times per day prior to and during the time of the patients' asthma season. This proved very effective.

In conclusion, this report describes two patients with inhalant miller moth asthma. The miller moth extract appeared to contain a variety of antigenic proteins which generally had molecular weights in the range of 50 to 75,000. Prophylactic treatment with sodium cromoglycate relieved the symptoms of asthma. It is hoped that this discussion will stimulate doctors to be meticulous in their history-taking from patients with asthma, and that they will obtain a very complete environmental and occupational history for all of these patients.

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