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INVESTIGATIONS ON CASTOR OIL PLANT ALLERGY IN A RURAL COLLECTIVITY

By

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Since the publication of the first note on allergy due to castor oil plant (Alilaire 1914), similar cases have been mentioned in laboratory or in industrial workers; in the last fifteen years "small epidemics" were recorded, due to the use of castor oil cakes as fertilizers in agriculture, or to living in the neighbourhood of factories processing this plant (Bauru, Johannesburg, Marsilia, Toledo, etc.). In our country, the first cases of ricin allergy in the rural environment were noted by Cănciulescu and co-workers (1958) and Dinischiotu et al. (1959).

Castor oil plant cultivation on an ever larger scale in recent years in our and in other countries, as a result of castor oil utilization in industry, increased the number of cultivators and consequently the percentage of the allergic diseases.

The targets of the present study were:

- to ascertain the existence of ricin allergies in cultivators;
- to investigate clinically and statistically the patients and those coming into contact with the plant and to study the conditions of occurrence of ricin allergy;
- to study the behaviour of allergic skin tests (and if necessary of bronchial ones) in workers coming into contact with castor oil plant;
- to establish measures for prophylaxis and treatment.

MATERIAL AND METHOD

In October and November 1960, the authors studied at their place of work the castor oil plant cultivators of a rural collectivity; those were selected for a more minute study who presented allergic symptoms as well as a number of asymptomatic individuals who constituted the control groups.

Statistical analysis was made of the data concerning age, sex, duration of the contact, time of onset of the first symptoms, and the clinical allergic form at the time of investigation.

All individuals underwent a full clinical and laboratory examination, eosinophil count (blood, sputum, nasal secretion), respiratory tests (vital capacity, maximum breathing capacity, one second maximum expiratory volume, inspiratory capacity, pneumatochogram, etc.) before and after acetylcholin and aleudrin aerosols, complex microphotographic examination (5-7 incidences) and skin testing with ricin or other allergens.

The allergens employed in testing were prepared by the authors after the method of Grabar & Koutseff (1954); they used integral extracts and separate extracts of shell, cuticle and bean; likewise, allergens extracted from the green castor oil fruit as well as from its shell covered with a layer of mould were used in several patients; fifteen allergens in all were employed for these tests.

The passive transfer test (Prausnitz-Küstner), determination of serum histamine pexic power as well as bronchial provocation tests were also performed in some of the hospitalized patients.

RESULTS

The statistical analysis of data pointed to a slight prevalence in females; the maximum age of onset ranging between 31 and 50 years (57 per cent) and duration of contact with the plant varying from 2 to 19 years in 88.2 per cent of the cultivators.

The first allergic manifestations set in in most patients (86 per cent) after the first 1-2 or 2-5 years of contact with the plant.

In relation to the various stages of cultivation and processing of the plant, the most frequent allergic manifestations were observed to appear at threshing (62.2 %) then at drying, gathering in, siloing etc.

The anamnesis revealed collateral allergic past history in 4.5 per cent and personal allergic history in 16 per cent of the patients. The allergic diseases were chiefly due to house or street dust, feathers, cotton, wheat and maize flour, animal skin and hair, etc.

The authors found that the first clinical syndromes were: allergic rhinitis (65.7 %), bronchial asthma (15.4 %), rhinitis accompanied by bronchial asthma (2 %), allergic dermatosis (5.4 %) and indefinite in the rest of the patients.

The clinical forms of the ricin allergy observed in the same patients were: rhinitis (35.2 %), rhinitis + bronchial asthma (26.7 %), bronchial asthma (13 %), intricate asthma (12.9 %), bronchial asthma complicated with phenomena of cardiac failure (3.9 %), allergic dermatosis (5.4 %) etc.

In most cases, the seasonal factor that induced the disease was the contact with the ricin allergen during one of the phases of growing or processing of the plant (chiefly during threshing). The allergic dermatoses were apparent mainly during the manual gathering in of the capsules.

Blood eosinophils were found increased in 72 per cent of the symptomatic patients (mean value about 10 per cent, the limit ranging from 5 to 23 per cent) and present in only 4 per cent of the asymptomatic cases. Eosinophilia was noticed in 49 per cent of the patients suffering from allergic rhinitis, while sputum eosinophils were present in 74 per cent of the cases with bronchial asthma.

The functional respiratory tests showed an absolute agreement with the clinical data, skin tests, eosinophil count.

Disagreement between the respiratory functional tests and the clinical data and eosinophil count was apparent in three groups of patients; the first consisted of asymptomatic individuals with positive respiratory tests in 6.6 % of the cases, the second of patients with clinical symptoms of bronchial

asthma and negative respiratory tests, and the third of patients with allergic rhinitis and positive respiratory tests.

Observation of the last group revealed data similar to those of Turiaf and co-workers who noticed a simultaneous sensitization both of the nasal mucosa and of the whole bronchial tree. Nine patients admitted to hospital with bronchial asthma underwent provocation tests by ricin allergen aerosols in a dilution of $1/100.000.000$ – $1/1.000.000.000$; in seven patients it was found a 25–35 % decrease in the one second maximal expiratory volume, two of them having a slight attack of asthma, while one presented certain sibilant rales.

About 3,000 intracutaneous, scratch or prick tests were performed with integral or partial allergens, several being usually employed in the same patient. The results were recorded at 10–30', 60', 24 h or even more. In 9 patients attacks of asthma appeared in the first 24 hours following testing; the patients were never tested during an attack.

The allergens that brought about the most frequent and intense reactions were the integral ones, prepared by the method of Grabar (about 80 per cent of the cases of asthma), those prepared from shell (the method of Grabar or Frugoni) and from shell + mould (the method of Frugoni). In most cases dilutions were used of $1/5.000.000$ – $1/100.000.000$, with a protein nitrogen content of 2.3–23 gamma ‰ and protein quantity of 14–140 gamma ‰ . Aerosols with ricin allergens were performed only in the 9 patients already mentioned. The tests were repeated in the same patients at intervals of 6–9 months, that is during their stay in the hospital.

In 20 per cent of the patients in which anamnesis revealed bronchial asthma, the skin tests were negative, this being more frequently encountered in females; the authors consider that it was question rather of respiratory neuroses than of asthma.

The skin tests (seldom the nasal ones) were positive only in 59 per cent of the cases of rhinitis and in about 39 per cent of the cases of intricate asthma, that is in those in which anamnesis revealed ricin bronchial asthma.

In 13 per cent of the individuals asymptomatic clinically be-

fore testing, the skin tests were positive, particularly to extracts of shell + mould; 4 % of these also presented modifications following respiratory functional tests.

In patients with allergic symptoms due to castor oil plant, the skin tests were positive as follows:

cotton 5 %
house or street dust 30 %
mill and stable dust 20 %
wheat and maize flour 1 %
hay and climatic allergen 1 %
pollen mixture 15 %
animal skin and hair 9 %
feathers 4 %

The latter data are relatively similar to those found by Panzini and co-workers (1958).

The skin tests performed simultaneously in patients with bronchial asthma due to other causes than castor oil plant were negative to ricin allergens, except two cases who had been in indirect contact with the plant.

The passive transfer test (Prausnitz-Küstner) was positive in 8 of 12 tests performed with the serum of patients with ricin allergic bronchial asthma.

DISCUSSION

From observations it is obvious that the number of allergic diseases due to castor oil plant is directly proportional to the number of individuals coming into contact with the plant. The clinical syndromes most often encountered are respiratory, (allergic rhinitis or bronchial asthma); occurrence of the allergic diseases is most frequent in grown ups, after a 2-5 years period of intermittent contact with the plant. Besides the contact, the constitutional factors as well seem to play an important part; this assertion is also backed by the existence of the family allergic factor.

As threshing is the most allergenic phase of cultivation, the authors supposed that ricin allergen might be found, in the shell and in the capsule as well; the positive skin tests with allergens prepared from these parts of the plant enforce this observation.

Prevalance in the clinical onset of allergic rhinitis, alone or in association with bronchial asthma, points to the fact that the gateway of allergens as well as the shock organ are represented by various segments of the respiratory apparatus; the skin is seldom the inlet of allergens.

Diagnosis of the clinical syndromes of ricin allergic diseases is easily made with the aid of the complex means used by the authors. This does not hold true for skin allergies (dermatoses) in which the laboratory data are not reliable, and for rhinitis which should be differentiated from nasal irritation due to inert powders, occurring at threshing and disappearing soon after. The positive skin tests in only 59 % of the patients with nasal symptoms might be accounted for in this way; likewise, the presence of eosinophils in only 49 % of the same cases.

Bronchial asthma is not difficult to diagnose; it belongs to the pollen type, with sudden onset and end, often preceded by days, months or even years of allergic rhinitis. In the cases in which rhinitis precedes only by several hours the attack of asthma, the latter is difficult to differentiate from the proper asthma prodrome.

The diagnosis of asthma due to castor oil plant is also backed by the positive respiratory tests, eosinophilia, and the positive cutaneous tests with specific allergens.

First, the attack of ricin asthma occurs only during a certain phase of cultivation; after a period of time varying with each individual it may also appear during other operations or even at smell of the plant.

The attack of bronchial asthma is aggravated by dust, smoke, cold and subsequent allergies.

As long as bronchial asthma is not complicated, sputum eosinophilia may be often encountered. Its complication with

bronchial inflammations increases the number of sputum polynuclears, reducing the incidence of eosinophils.

Eosinophilia often persists even in periods asymptomatic clinically.

In some patients, the evolution of the respiratory allergy may pass through stages of rhinitis, bronchial asthma, intricate or complicated asthma.

The clinically asymptomatic cultivators with positive skin tests may be considered in the latency period of their allergic diseases, that is in a pre-clinical stage which should be followed up.

Negative cutaneous tests in patients with manifestations of respiratory allergy, particularly in women, raise the problem of a differential diagnosis with respiratory neurosis.

In the cases here presented as well as in those studied by other investigators, respiratory functional tests, eosinophil counts and eosinophilia have been very useful for the pathogenic diagnosis; provocation tests by ricin allergen aerosols have been very important in the etiological diagnosis, particularly when anamnesis was inconclusive.

CONCLUSIONS

1. Allergy due to castor oil plant might be frequent in cultivators with a prolonged intermittent contact.
2. In the cases here presented, threshing was the most harmful technological phase.
3. Respiratory allergies are the prevailing clinical syndromes.
4. The personal and heredo-collateral allergic history play a certain part in the occurrence of ricin allergic diseases.
5. A remarkable agreement was found in these patients between anamnesis, clinical objective examination, respiratory functional tests, eosinophil count and positive cutaneous tests to specific allergens.
6. Prophylaxis is achieved by improvement of the various technological procedures.

7. In allergic rhinitis due to castor oil plant, administration of synthetic antihistaminics and sometimes long term specific desensitization yield satisfactory results. In bronchial asthma, elimination of the specific allergen and desensitization with specific allergen are often useful to the patients.

8. It is recommended that specific desensitization should be performed "per os" by scratch test and rarely by allergen aerosols in the fourth dilution or even higher.

9. Desensitization with other allergens (house dust, feathers, pollen etc.) is useful besides specific desensitization.

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