

USE OF MONKEYS TO DEMONSTRATE ALLERGIC CROSS-REACTIONS AMONG THE EUPHORBIACEAE: *RICINUS COMMUNIS*, *POINSETTIA PULCHERRIMA*, *EUPHORBIA ESULA*

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IN an earlier paper¹ we have shown that human beings who are allergic to the seed proteins of *Ricinus communis* (castor bean) give positive skin-scratch reactions to the pollen also. Sera from these individuals sensitized monkeys (*Macaca irus*) to both the seed protein² and the pollen.¹ From these studies and earlier studies with guinea pigs,³ we concluded that human beings can be sensitized to castor bean meal by initial contact with either the blossoms and pollen or the seed proteins. In France, R. Panzani⁴ obtained positive skin reactions in 42 of his castor-allergic patients with a sample of castor pollen extract prepared in our laboratory.

Violent reactions to castor bean meal are occasionally observed in individuals who claim never to have been in contact with either the meal or the growing plant. Some of these people may have been sensitized by unrecognized contact with castor antigens, but in other cases the source of sensitizing antigens cannot be as easily explained.

Perlman⁵ has shown that patients allergic to one species of insect often show skin sensitivity to members of one or more related genera within an order. Antigens of midges, gnats, and houseflies tend to elicit allergic cross-reactions in individuals who are allergic to the mosquito. *Ricinus communis* (castor bean) is a member of the family Euphorbiaceae, and hence it was considered possible that commonly occurring euphorbiaceous plants might have been involved in some cases of sensitization to castor bean.

EXPERIMENTAL METHODS

Other than castor (*Ricinus communis*), only two decorative euphorbias were readily available to us for the preliminary investigation: *Poinsettia pulcherrima* (poinsettia) and *Euphorbia esula* (leafy spurge), both shown in Fig. 1. True blossoms were obtained from ornamental poinsettias grown in a local garden. The blossoms, including the pollen, were ground in a TenBroeck Pyrex glass tissue homogenizer and the paste suspended in isotonic saline solution and centrifuged. Approximately 0.5 ml. of the resulting clear amber extract was pre-

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pared from each gram of ground blossoms. Two seed capsules were obtained from one poinsettia plant; the seeds were ground and extracted to give a 1:20 dilution. Blossoms from leafy spurge were collected, ground, and extracted with saline as was done for the poinsettia blossoms. The seeds of leafy spurge, borne in capsules similar in appearance to miniature castor capsules, were ground and extracted with 95 per cent alcohol to remove the fat; the residual paste then was extracted with 10 volumes of isotonic saline. All the extracts were centrifuged at 3,000 r. p. m. prior to their being injected into test animals.

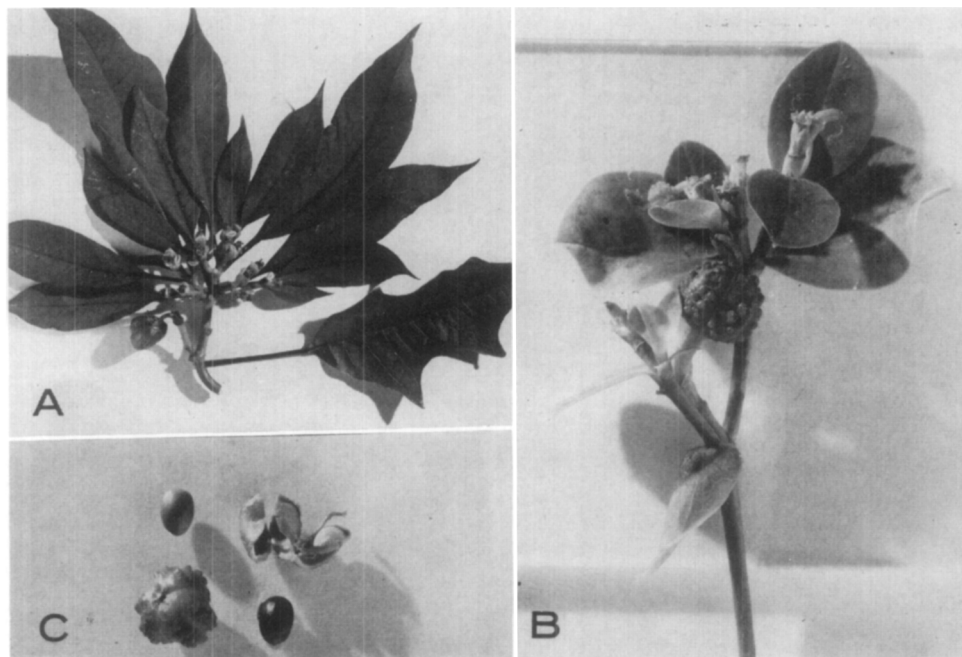


Fig. 1.—A, Poinsettia blossoms and bracts. B, Leafy spurge. C, Capsule and seeds of leafy spurge.

Rabbit anti-castor seed serum and anti-castor pollen serum were prepared from blood of rabbits that had been sensitized with the respective antigens in Freund's complete adjuvant. When tested by guinea pig passive cutaneous anaphylaxis (PCA) to homologous antigens, the sera gave 2+ reactions at 1:5,000 dilution.

Human allergic sera were obtained from castor-allergic employees of a local castor processing factory. These patients and their sera have been described in previous papers.^{1, 2} Passive cutaneous anaphylaxis tests were conducted upon guinea pigs in the manner suggested by Ovary⁶ and by Layton and co-workers.⁷ Ten guinea pigs were used for testing each antigen. The cross-reactivity of castor-allergic human sera was determined in 6 *Macaca irus* monkeys by the method described by Layton and co-workers.^{1, 2}

RESULTS AND DISCUSSION

Intravenous challenge of sensitized guinea pigs with extract of poinsettia

blossoms elicited 4+ PCA reactions with extravasation of Evans blue dye in sites sensitized with rabbit antisera to castor pollen, seed protein, and seed meal. These results strongly suggest immunologic cross-reaction between these euphorbias. Typical PCA cross-reactions to poinsettia are shown in Fig. 2.

Challenges with extracts from blossoms and from seeds of leafy spurge produced 4+ reactions in sites sensitized with anti-castor pollen and anti-castor seed protein sera, and 2+ in sites sensitized with anti-serum to crude castor bean meal. A typical pattern of PCA reactions to leafy spurge is shown in Fig. 2.



Fig. 2.—Passive cutaneous anaphylaxis in guinea pigs sensitized with rabbit anti-castor bean and anti-pollen sera and then challenged with (A) extract of poinsettia blossoms, and (B) extract of seeds of leafy spurge.

Since both of these Euphorbiaceae showed immunologic cross-reactions with castor, it was with considerable interest that we conducted the PCA tests for human allergic serum cross-reaction in monkeys. The PCA reactions in monkeys were immediate and definite. Leafy spurge seed extract caused a 4+ reaction with the serum of donor H. E. (Fig. 3), a reaction that was indistinguishable from those previously obtained with castor seed proteins. Extract of poinsettia blossoms elicited PCA reactions with intensities ranging from 1+ to 3+ in sites sensitized by sera from certain humans allergic to castor seed proteins (Fig. 4). A comparison of PCA reaction to castor pollen and poinsettia blossoms is shown in Table I.

Although our original premise was that certain castor-allergic individuals may have been sensitized by contact with the seed or blossom antigens of other



Fig. 3.—Passive cutaneous anaphylaxis in 2 monkeys sensitized by sera from a castor bean-allergic human, then challenged with extract from seeds of leafy spurge.



Fig. 4.—Passive cutaneous anaphylaxis in a monkey sensitized by sera from castor bean-allergic humans, then challenged with extract of poinsettia blossoms (right eyelid and right cheek, left jaw).

TABLE I. EXTRAVASATION OF COLLOIDAL DYE IN MONKEYS THAT WERE PASSIVELY SENSITIZED BY SERA FROM PATIENTS ALLERGIC TO CASTOR BEAN SEED AND THEN CHALLENGED WITH CASTOR POLLEN EXTRACT OR POINSETTIA BLOSSOM EXTRACT

SERUM DONOR	REACTION TO CASTOR POLLEN	REACTION TO POINSETTIA BLOSSOM
H. E.	3+	1+
R. B.	4+	2+
W. R.	0	0
F. C.	0	0
K. H.	1+	1+
E. J.	4+	1+
R. H.	1+	0

members of the family Euphorbiaceae, we have not yet proved the point. We have shown, however, that members of this family do elicit allergic cross-reactions, and there is little doubt that the castor-allergic individual will often be found to be allergic to other euphorbias also. The patient who is highly allergic to one species of euphorbia should avoid respiratory contact with the others, especially with dry castor bean proteins. It is possible that successful desensitization to castor bean proteins might likewise effect simultaneous desensitization to certain other euphorbias and conversely.

SUMMARY

Individuals who are sensitized by or allergic to one species of Euphorbiaceae may be allergic to other species also. Guinea pigs passively sensitized with sera from rabbits that had been sensitized to *Ricinus communis* (castor bean) exhibited passive cutaneous anaphylaxis with extravasation of Evans blue dye when challenged with antigens extracted from the blossoms and seeds of *Poinsettia pulcherrima*, or *Euphorbia esula*. *Macaca irus* monkeys passively sensitized with blood sera from castor bean-allergic human beings exhibited PCA reactions when challenged with blossom antigens from either of these euphorbias.

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