

MULTIPLE ALLERGIES TO THE POLLEN AND SEED ANTIGENS OF *RICINUS COMMUNIS* (CASTOR BEAN)

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IN EARLIER studies¹ it was observed that castor bean seed proteins caused anaphylactic contraction in smooth muscle from guinea pigs that previously had been sensitized by the injection of castor bean pollen or female blossoms. It was suggested that these plant reproductive tissues may possess certain antigenic components in common and that the pollen or dry female blossoms may be involved in the initial sensitization of certain humans to the seed meal. It has been shown^{1, 2, 3} that seven or more protein components of the seed are antigenic.

Upon the development of passive sensitization allergy tests in monkeys,^{4, 5} it became feasible to conduct valid laboratory studies upon human allergies. The blood sera of individuals known to be allergic to castor bean seed proteins were tested for reactivity to pollen by passive cutaneous anaphylaxis (PCA) in the monkey. Confirmatory skin tests were then conducted upon the donors of the serum samples.

EXPERIMENTAL

Four cynomolgus monkeys, *Macaca irus*, were injected intradermally with blood sera from 13 individuals known to be allergic to castor bean seed proteins and 7 individuals who were not allergic.⁵ Forty-eight hours after the sensitizing injections, each monkey was injected intravenously with 2 ml. of 0.5 per cent solution of Evans blue dye in isotonic saline followed by intravenous injection of the saline extract from 50 mg. of defatted and ground castor bean pollen.

The intensities of the resulting PCA reactions were graded on an arbitrary scale ranging from 0 for no reaction to 4+ for colored areas 15 mm. or more in diameter. When the color due to extravasation of dye had become sufficiently intense, the animals were photographed in Kodacolor, and, from these negatives, black and white prints were made. Typical PCA reactions to pollen are shown in Figs. 1 and 2.

Twelve of the 13 allergic donors of serum had been skin-tested for sensitivity to castor bean seed proteins,⁶ and 10 of these submitted to skin-scratch tests for sensitivity to castor bean pollen. The scratch tests were conducted as previously described⁵ using 1:2,000 and 1:30 dilutions of the solids extracted

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by warm water from pure castor bean pollen which had been defatted and ground in a new glass tissue homogenizer. Skin reactions were graded from 0 for no reaction to 3+ for wheals 10 to 20 mm. in diameter.

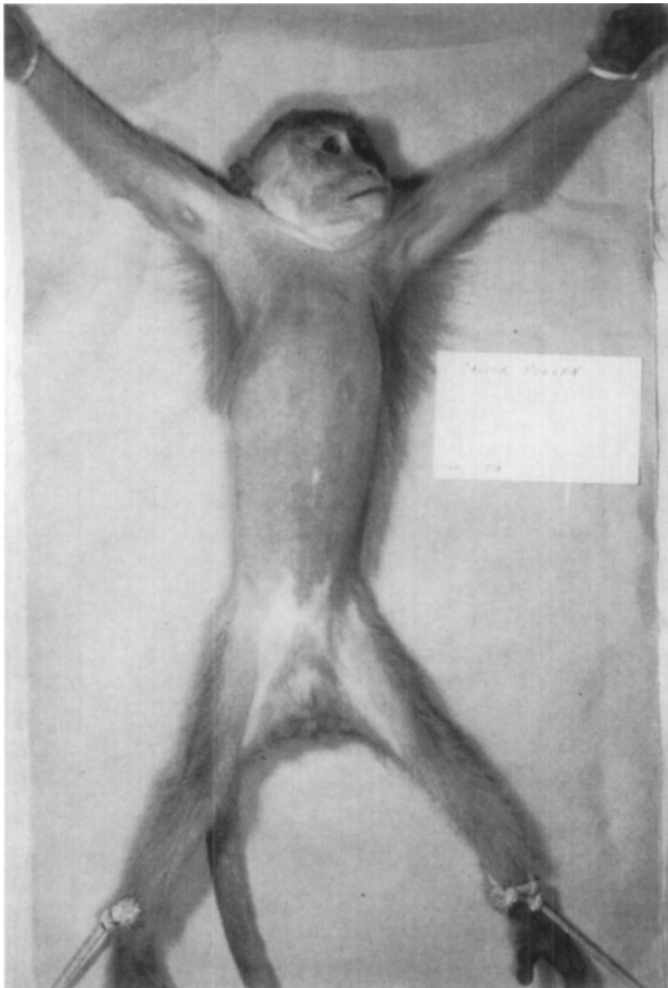


Fig. 1.--Passive cutaneous anaphylaxis in monkey sensitized with human sera and then challenged by intravenous injection of an extract of pure castor bean pollen and Evans blue dye. The oval dark spots on the two arms, right cheek, and left side of the abdomen are positive PCA reactions.

RESULTS AND DISCUSSION

The results obtained with pollen extracts were compared with those earlier with castor bean seed proteins as shown in Table I. The PCA reactions to the pollen extract were quite definite, and wheals formed in almost all of the sites exhibiting extravasation of the blue dye. We have previously pointed out that wheals do not always appear, even though intense blueing will occur during the PCA reaction in the cynomolgus monkey.⁴ The reactions to pollen are presented in the fifth column of Table I. The scratch test results are tabulated in the second and fourth columns of Table I.

The intensities of reactions to highly concentrated pollen extracts when compared with those to castor bean seed proteins appear to indicate a definite but less severe sensitivity to the pollen. The PCA tests in the monkeys appear to reflect a similar relationship.

Only one individual (H. F.) of the 12 giving positive skin reactions to castor bean seed protein gave no PCA reaction to seed protein in the monkey. Of those giving positive skin reactions to pollen extract, 3 gave no reaction to pollen in the monkey PCA tests. This apparent lack of agreement may possibly be attributed to a low titer of reagins to the pollen allergens.

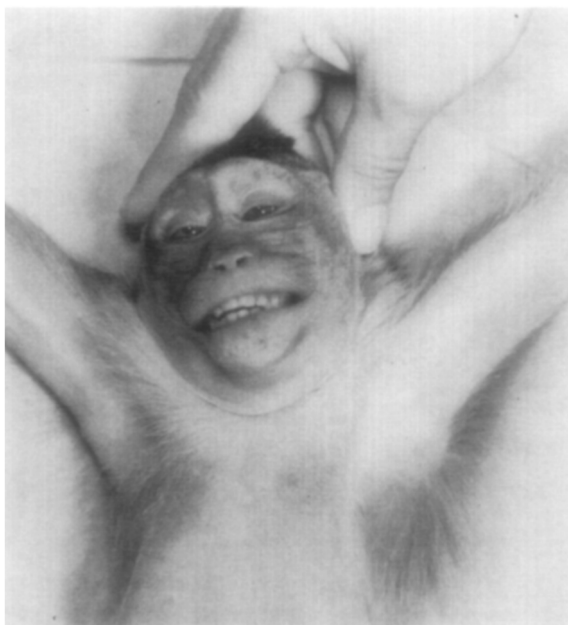


Fig. 2.—Passive cutaneous anaphylaxis with wheal on right eyelid of monkey sensitized with serum from castor bean meal-allergic human and then challenged with aqueous homogenate of pure castor bean pollen.

TABLE I. COMPARISON OF SCRATCH TESTS AND PASSIVE CUTANEOUS ANAPHYLAXIS TESTS FOR HUMAN ALLERGY TO SEED AND POLLEN ANTIGENS OF CASTOR BEAN

INDIVIDUAL	SCRATCH TEST WITH SEED PROTEIN	PCA IN MONKEY (SEED PROTEIN)	SCRATCH TEST WITH POLLEN	PCA IN MONKEY (POLLEN)
K. H.	Not tested*	4+	Not tested*	1+
E. J.	3+	4+	1+	4+
H. E.	3+	4+	1+	3+
C. W.	3+	4+	1+	4+
E. B.	3+	4+	1+	4+
R. H.	2+	4+	Not tested†	1+
W. R.	2+	4+	0	0
C. H.	2+	3+	1+	0
M. H.	3+	4+	1+	1+
R. P.	3+	4+	1+	1+
F. F.	±	4+	±‡	±
F. C.	3+	4+	Not tested§	0
H. F.	3+	0	2+	0

*Not an employee, not available for skin tests.

†Not available for skin test with pollen.

‡Results difficult to interpret because of dermatographia.

§Refused to be tested with pollen.

One individual (W. R.), known to be highly sensitive to castor bean seed antigens, showed no sensitivity to castor bean pollen either by direct scratch test or by the PCA test. This differential sensitivity to the two materials would appear to indicate that W. R. is sensitive only to seed components which are not present in the pollen. The lower order of sensitivity to the pollen shown by most of the individuals tested may be indicative of a lesser number of potent allergenic components in the pollen as compared to the seed, of lower concentration of antigenic components in the pollen, or, possibly, that the individuals were originally sensitized by contact with the seed protein complex such as would be found in the meal.

The Schultz-Dale Tests conducted upon actively sensitized guinea pigs¹ also indicated only a partial cross-reaction between seed and pollen and their antibodies.

SUMMARY

Ten individuals shown by skin test PCA reaction in monkeys to be allergic to castor bean seed proteins were skin-tested for sensitivity to the castor bean pollen. Nine of these gave mild reaction to the pollen. Blood sera from the 10 individuals together with those of 3 other castor bean-allergic individuals were tested by passive cutaneous anaphylaxis in the cynomolgus monkey, *Macaca irus*. Six of the 9 giving positive skin sensitivity to the pollen also gave positive PCA reactions in the monkey. Of the 3 who were not skin-tested with pollen, the sera of 2 gave PCA reactions to pollen when tested in the monkey.

The evidence indicates that the pollen and seed have certain allergenic components in common, but that allergic reactions to the pollen are less severe than to the seed meal.

In certain instances, pollen from castor bean plants grown in fields or as ornamental plants near houses may be involved in the initial sensitization of humans to the castor bean seed proteins or meal.

William G. Murray, Divisional photographer, performed the photographic work for this paper.

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