

Specific sensitivity to individual grass pollens in some hay fever patients

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Summary

It has been shown in a series of 338 hay fever sufferers that about 19% give one or more (up to nine) negative skin test reactions when tested by the prick test technique to extracts of the pollens of twelve of the most widespread British grasses.

Introduction

In the hyposensitization treatment of hay fever there is considerable divergence of opinion as to whether it is better to use the extracts of the pollens of very few varieties or whether the use of a mixture of a considerably larger number of varieties is more efficacious.

At the one extreme are those who assert that, because most grass pollens appear to contain a common allergenic factor, or one that is so similar as to be difficult to differentiate, it should be necessary to use only one grass pollen extract in the hyposensitization treatment of hay fever.

If one accepts this hypothesis, then the natural choice of pollen would be between cocksfoot, fescue, meadow, rye grass and timothy, since these are among the most readily available, and give high yields of pollen. In the South of England timothy pollen is not shed, however, until the first week in July, whereas fescue and meadow grass pollens start to be shed during the first week in June.

On the other hand, there are those, including the authors, who believe that as wide a variety of grass pollens as is practicable should be employed. The hypothesis on which this belief is founded is that while many hay fever patients may be sensitive to the common or similar allergenic factor in grass pollens, there are some who are sensitive to the specific allergenic factors which individual grass pollens possess.

The use of a fair number of grass pollens does not reduce the effectiveness of treatment of those sensitive to the common (or similar) factor and yet it provides a better chance of benefit to those who are sensitive to the specific factor or factors in some of the grass pollens.

The work of Gosselin *et al.* (1953), using the tanned red cell agglutination tech-

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nique with specific antisera, went a long way to demonstrate the presence of a common (or similar) factor in grass pollen extracts, and also to indicate the presence of factors specific to individual grass pollens. Feinberg (1960), using specific antisera with the Ouchterlony double diffusion in gels technique, obtained results which supported the observations of Gosselin *et al.* (1953)

It has been observed that among hay fever patients there are those who fail to respond when treated with the extracts of one or two grass pollens, but who benefit when treated with a mixture of twelve or more grass pollens, and who on testing with the extracts of the individual pollen extracts will be found to be sensitive to very few of the twelve. Unfortunately, these patients show a varied combination of sensitivities to individual grasses so that it is not possible to select a combination of a few grass pollens to cover the requirements of this group. In these cases, therefore, it is necessary to retest the individual grass pollen extracts, and to treat with a specific grass pollen or mixture of them. It was felt that an investigation into the specific grass pollen sensitivities, as indicated by skin tests, might clarify a situation on which opinion is still divided.

The work reported was completed in 1964, but was not prepared for publication at that time.

Materials and methods

The prick test extracts of the individual grass pollens used were those set out in Table 1, and were the standard Bencard materials prepared at 2.5% (25,000 Noon units/ml) in an extracting fluid containing 50% of glycerine.

338 hay fever patients known to be clinically sensitive to grass pollens and having had no previous treatment with grass pollen extracts, and therefore without the possibility of iatrogenic skin sensitivities, were skin tested as follows.

The tests were done on the inner aspect of the forearm in two rows in such a way that each test was at least 1 inch (2.5 cm) from any other. Twelve individual grass pollen extracts and a control (fluid used in preparing the extracts) were used as described below.

A drop of the appropriate extract was placed on the skin, and using a sharp needle at right angles to the arm, the skin beneath the drop of fluid was pierced. After 5 min the extracts were wiped from the skin test sites using a separate piece of cotton wool for each in order to avoid cross-contamination.

Exactly 15 min after the prick was made, the mean diameter of the raised weal (if any) that was produced was measured. Allowance was made for any raised weal occurring at the control site (there were several dermatographic patients) in assessing the degree of the reactions in terms of plusses according to the criteria set out in Table 2.

The whole process of testing was duplicated at the same time on the other arm of

Table 1. Grass pollen extracts used

Brome	<i>Bromus mollis</i>	Meadow	<i>Poa pratensis</i>
Cocksfoot	<i>Dactylis glomerata</i>	Rye grass	<i>Lolium perenne</i>
Dogtail	<i>Cynosurus cristatus</i>	Timothy	<i>Phleum pratense</i>
False oat	<i>Arrhenatherum elatius</i>	Vernal	<i>Anthoxanthum odoratum</i>
Fescue	<i>Festuca elatior</i>	Wild oat	<i>Avena fatua</i>
Foxtail	<i>Alopecurus pratensis</i>	Yorkshire fog	<i>Holcus lanatus</i>

Table 2. Assessment of skin test reactions for grass pollens using the prick test

+	A raised weal of diameter up to 3 mm
++	A raised weal of diameter from 3 to 8 mm
+++	A raised weal of diameter from 8 to 16 mm
++++	A raised weal of diameter greater than 16 mm

the patient to ensure that a correct picture of the patient's sensitivities was obtained and to eliminate the possibility of errors in the prick test technique.

Results

Tables 3-9 show the number of patients out of the 338 tested who gave one negative and eleven positive reactions, two negative and ten positive reactions, and so on down to nine negative and three positive reactions.

It will be seen that in the majority of cases patients with one or more negative reactions gave very strong positive reactions to most of the other grass pollens and in every case the positive reactions were quite definite.

It is not practicable to tabulate the individual plus scores for each patient for each grass pollen, but Table 10 shows the consolidated position. It gives the number of negative reactions for each grass pollen, together with the number of +, ++, +++ and ++++ for the 338 patients tested, together with the total number of plusses recorded for each grass pollen.

Consideration was given to the possibility that the number of negative reactions per 100 patients for each grass pollen extract used, and the corresponding number of positive reactions (by adding the total number of plusses) per 100 patients might give some idea of the relative reactivities and therefore the relative importance of the individual pollens.

If one takes the ratio of plusses to negative reactions for each grass pollen extract per 100 patients as set out in the last column of Table 10, differences are seen ranging from 30 to 75. These ratios might be regarded as efficiency ratings, and it might be considered that a selection of pollens having the highest ratings could be a useful basis on which to formulate a grass pollen vaccine. However, when one refers to Tables 3-9 it is obvious that some of the lower rating grass pollens contribute to the overall balance in individual patients even when some of the highest rating pollens give negative reactions.

This view is supported by the fact that although some grass pollens give an appreciably higher number of negative reactions per 100 patients than others, the number of positive reactions per 100 patients only varies between 208 and 264 which suggests that these grass pollens cause approximately equal sensitivity in those who are sensitive to them. They would seem therefore to be equally important and possibly complementary in the combination used.

It can reasonably be concluded, from the results of the observations recorded in this communication, that in the case of hay fever sufferers there are those who are not sensitive to all grass pollens and that among such patients no single grass pollen gave more negative reactions than another among the twelve investigated. In this series 19%

Table 5. Skin test reactions in eleven patients each of whom gave negative reactions to three out of twelve individual grass pollens

Patient	Brome	Cocksfoot	Dogstail	False oat	Fescue	Foxtail	Meadow	Rye grass	Timothy	Vernal	Wild oat	Yorkshire fog
6848	+	+	+	-	+	-	+	+	+	+	-	+
7702	+	+	+	-	+	+	+	+	+	+	+	+
7718	-	+	+	-	+	+	+	+	-	-	+	+
8097	+	+	+	-	+	+	+	+	+	+	-	+
8444	+	+	+	-	+	+	+	-	+	-	+	-
8459	+	+	+	+	+	+	+	+	+	+	+	-
8635	+	+	+	+	+	+	+	+	+	+	+	-
8658	+	+	+	+	+	+	+	+	+	+	-	+
8743	+	+	+	+	+	+	+	+	+	+	+	+
8761	+	+	+	+	+	+	+	+	+	+	+	+
8804	+	+	+	+	+	-	+	-	+	+	+	-

Table 6. Skin test reactions in six patients each of whom gave negative reactions to four out of twelve individual grass pollens

Patient	Brome	Cocksfoot	Dogstail	False oat	Fescue	Foxtail	Meadow	Rye grass	Timothy	Vernal	Wild oat	Yorkshire fog
6774	+	+	-	-	+	-	+	+	+	-	+	+
7424	-	+	+	+	+	-	+	+	+	-	+	+
7649	-	+	+	+	+	+	+	-	+	+	+	+
7951	+	+	+	+	+	+	+	-	+	+	+	+
8452	+	+	+	+	+	+	+	-	+	+	+	+
8785	+	-	-	+	+	+	-	+	+	-	+	+

Table 7. Skin test reactions in four patients each of whom gave negative reactions in five out of twelve individual grass pollens

Patient	Brome	Cocksfoot	Dogstail	False oat	Fescue	Foxtail	Meadow	Rye grass	Timothy	Vernal	Wild oat	Yorkshire fog
7846	+		+	+	+	—	+	+	—	+	—	—
8075	+	—	+	+	+	—	+	+	—	+	+	+
8462	+	+	+	—	+	—	+	+	+	+	—	—
8653	+	+	+	—	+	—	+	—	+	+	—	—

Table 8. Skin test reactions in six patients each of whom gave negative reactions to six out of twelve individual grass pollens

Patient	Brome	Cocksfoot	Dogstail	False oat	Fescue	Foxtail	Meadow	Rye grass	Timothy	Vernal	Wild oat	Yorkshire fog
6624		+	+	+	-	+	+	+	+			
6650	-	+	+	-				+	+		+	+
7690			+	+	+	+		+	+		+	+
7799	+						+				+	
7833		-	+	+	+	+	+	+	+		+	+
8554		+	+	+	+				+		+	

Table 9. Skin test reactions in four patients, one of whom gave seven, one eight and two nine, negative reactions out of twelve individual grass pollens

Patient	Brome	Cocksfoot	Dogtail	False oat	Fescue	Foxtail	Meadow	Rye grass	Timothy	Vernal	Wild oat	Yorkshire fog
7680	+	+	+	+	—	—	+	+	—	—	+	—
8488	+	+	—	+	—	—	—	—	—	—	+	+
7759	—	+	+	+	—	—	+	—	—	—	+	+
8450	+	+	+	—	—	—	+	—	—	+	—	—

Table 10. Degree of skin test reactivity recorded for 338 hay fever patients when tested by the prick test technique with the individual extracts of the pollens of twelve different grasses

Grass pollen	No. of reactions of size shown						Total no. of plusses	Negative reactions per 100 patients	No. of plusses per 100 patients	Ratio +/—
	—ve	1+	2+	3+	4+	>4+				
Brome	11	52	83	121	54	7	830	3.2	245	75.5
Cocksfoot	12	38	84	137	61	2	871	3.5	257	72.7
Dogstail	11	59	100	120	46	2	813	3.2	240	74.0
False oat	16	47	91	122	50	2	805	4.7	237	50.3
Fescue	14	33	75	129	79	2	896	4.1	264	64.0
Foxtail	21	58	103	109	42	2	779	6.2	229	37.0
Meadow	16	77	101	118	19	2	719	4.7	212	45.0
Rye grass	14	42	84	149	41	1	826	4.1	233	68.0
Timothy	18	48	67	149	47	3	832	5.3	245	46.4
Vernal	23	65	108	108	22	3	708	6.8	208	30.7
Wild oat	18	53	107	109	50	2	804	5.3	237	44.7
Yorkshire fog	19	55	99	120	33	4	765	5.6	225	40.3

of the patients gave no skin test reaction to one or more of the twelve grass pollens used.

The patients included in this survey underwent hyposensitization treatment with a mixture of equal parts of the extracts of the twelve grass pollens concerned.

Of the sixty-five who gave negative reactions to one or more of the individual grass pollen extracts, it was possible to follow up forty-nine and to obtain the results of treatment.

Table 11 gives the assessment of the results of treatment together with the number of individual grass pollens out of the twelve to which they gave negative skin tests.

Table 11. Results of hyposensitization of forty-nine patients (giving negative reactions to one or more pollens) using a mixture of the extracts of twelve grass pollens

Patients	No. of grass pollens to which negative reactions were given									Total	%
	1	2	3	4	5	6	7	8	9		
Symptom free	3	2	1							6	12
Substantial improvement	7	7	6	2	1	2			2	27	55
Moderate improvement	7	3	2		1					13	27
Slight improvement		1					1			2	4
No change	1									1	2

'Symptom free' indicates complete freedom from hay fever during the following season. 'Substantial improvement' indicates that the symptoms were so mild as to occasion no inconvenience to the patient, and requiring no symptomatic treatment. 'Moderate improvement' indicates definite improvement needing only occasional palliative treatment. 'Slight improvement' indicates that the symptoms were not quite so severe as in previous seasons.

From this table it would appear that good results can be obtained by hyposensitization with a mixture of the extracts of twelve grass pollens even though a patient may be insensitive to a number of the twelve grass pollens used.

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References

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