

PITYROSPORUM OVALE AS A CAUSE OF ALLERGY TO HUMAN SCURF

BY

W. HOWARD HUGHES, M.D.

AND

ELIZABETH D. HAMILTON, Ph.D.

Wright-Fleming Institute, St. Mary's Hospital Medical
School, London

Recently the importance of mould allergy has been recognized in Britain. This is largely due to the papers of Hyde and Williams (1949), Frankland and Hay (1951), and Stillwell *et al.* (1947), who showed respectively the prevalence of mould spores, the existence of dry-rot sensitivity, and the relationship of mould sensitivity and house-dust reactions.

Consideration of industrial allergy makes it obvious that patients become sensitive to those substances concentrated in their environment. This prompted us to consider the fungi with which patients were most closely in contact. The role of the dermatophytes in causing eczema as well as local inflammation is well known, but there are at least two other fungi which merit investigation. The first, *Candida albicans*, is a recognized pathogen on mucous membrane and occasionally on skin and nails, while *Pityrosporum ovale* is a saprophyte on human scurf. The main purpose of this paper is to investigate the possibility that *P. ovale* might act as an allergen; similar evidence about *C. albicans* was obtained incidentally.

There is no indication in the literature that *P. ovale* has ever been proved to be responsible for allergic symptoms. Yet here is a fungus to which the skin should have unique opportunities of becoming sensitized. It was determined, therefore, to carry out a systematic survey of allergic patients for evidence of positive skin reactions and clinical responses to this organism.

Method and Material

Preparation of the Extract.—A culture of *P. ovale* (Bizzozero) Castellani and Chalmers was obtained from the collection of the London School of Hygiene and Tropical Medicine. This was inoculated on to malt agar slopes, flooded with Martin-Scott's medium, containing 100 g. of sodium tauroglycocholate and 50 g. of oxoid mycological peptone per litre of tap-water, and incubated at 37° C. for three weeks. The yeast growth was harvested into sterile carbol saline, 1 ml. to each slope, and refrigerated for a week to allow settling. The supernatant was sterilized by Seitz filtration.

Cases.—From January, 1957, to the middle of February, 1958, every patient attending one particular afternoon clinic was automatically investigated. No selection of any sort was made, even the obvious grass-pollen allergies being included, but a complete cross-section of the population was not obtained, as, wherever possible, children under 12 were directed to a separate clinic at another time. It is unlikely that this makes any difference to the conclusions reached, although a similar survey of children, particularly those with eczema, is still needed.

Skin Testing.—The method of skin testing in use in the clinic is to prick through a drop of the extract at a concentration equivalent to 20,000 Noon units. Most of the

extracts were used first in groups of five. If the group were positive then the individual substance was identified by re-testing. Practical considerations limit the extent of testing, and only 64 substances were used as a routine. Nineteen of these were fungi selected as a result of studies of the spore content of outdoor air and of direct examination and culture of dust samples from patients' homes. We are conscious that the series is inadequate, but feel that for the exceptional case it is better to prepare special cultures and house-dust extracts than to inflict a more extensive series of tests on all the others. As we show later, a comprehensive fungus allergen is probably unobtainable. Our list of fungi is shown in Table II.

Results

Table I shows the results. The recorded positives are not necessarily all significant. They include four of five cases sensitive to all fungi, with extracts of other fungi, and a

TABLE I.—Distribution of Skin Reactions in 503 Allergic Patients

Total No. of Patients	Skin Tests		<i>P. ovale</i>	
	Negative	Positive	Positive	Negative
503	212	291	38	253

further 14 where it is doubtful whether the reaction is large enough to be important and where the clinical evidence for sensitization is absent.

Table II shows the reactions obtained. It will be seen that there is no appreciable difference between the two groups, although the frequency of fungi reaction is greater

TABLE II.—Cross-reactions Between Patients Positive to *P. ovale* and Other Fungi Compared with Those Negative to *P. ovale*

	<i>P. ovale</i>	
	Positive (38)	Negative (253)
<i>Cladosporium fulvum</i>	10	9
<i>herbarum</i>	4	3
<i>Aspergillus flavus</i>	9	10
<i>terreus</i>	8	10
<i>Alternaria</i>	9	9
<i>Sporobolomyces</i>	8	6
<i>Ustilago</i>	8	5
<i>Lycoperdon</i>	6	5
<i>Botrytis</i>	9	10
<i>Penicillium cyclopium</i>	5	9
<i>frequentans</i>	6	8
Yeast	7	3
<i>Rhizopus</i>	7	3
<i>Merulius lacrymans</i>	5	9
<i>Trichophyton interdigitale</i>	6	2
<i>Candida albicans</i>	5	4
<i>Epidermophyton floccosum</i>	6	6
<i>Trichothecium roseum</i>	0	6
Mixed house dust	22	157

among those positive to *P. ovale*. Certainly there is no constant cross-reaction. It is clear also that our house-dust extract does not give a positive with all our *P. ovale* reactors. As at this time we do not know whether *P. ovale* could be isolated from animals as well as from humans we have compared cross-reactions with animal hairs and scurf in Table III. Neither here nor with any of our other ex-

TABLE III.—Cross-reaction Between *P. ovale* and Other Common Allergens

	<i>P. ovale</i> Positive (38)	<i>P. ovale</i> Negative (253)
Horse	11	48
Cat	8	22
Dog	2	10
Feathers	1	6
Wool	0	5
Farm animals	0	16

tracts were there any cross-reactions. Martin-Scott (1952) has in fact demonstrated *P. ovale* in the hair of a llama and of a dog.

If the 38 patients positive to *P. ovale* are re-examined it is found that half of them have reactions equal to or larger than that of the histamine controls. Table IV analyses their

TABLE IV.—Frequency of Other Reactions in Patients Positive to *P. ovale*

<i>P. ovale</i>	Total Other Reactions							Mixed Dust	Horse	Grass Pollen
	0	1	2	3	4	5	5+			
19	2	4	2	3	2	1	5	10	6	9

TABLE V.—Distribution of Symptoms in Patients with *P. ovale* Reactions

Total Cases	Scurfy	Eczema		Rhinor-rhoea	Asthma	Conjunctivitis
		Now	Previously			
19	4	2	3	5	12	1

other reactions. Table V gives the clinical symptoms of these cases. Several patients had more than one symptom. It will be seen that there is no greater frequency of skin reactions to *C. albicans* than to the other fungi tested, and those patients giving reactions to it are mainly those with a general response to this group of allergens.

Case Histories

The clinical histories fell into two main groups; those affected by their own scurf, and those not themselves scurfy but reacting to others.

Case 1.—A single woman aged 21 had already virtually diagnosed the condition herself, since the eczema from which she suffered was distributed according to her hair style. At school she had worn her hair down to her shoulders, and the rash extended on to her back and upper arms. When she changed to short hair styles she was left with eczema limited to scalp, ears, and sometimes her hands. Her condition, like that of several others, was complicated by a secondary dermatitis due to sensitization to a preparation used in treating her dandruff. This was overcome by teaching her to patch-test herself with any preparation before she used it on her head.

Case 2.—A married woman aged 61 had had rhinorrhoea for 10 years. This was worse in winter than in summer, and was particularly severe at week-ends, when her son, who worked in another town, came to visit her. She realized that house dust upset her. Her only positive reactions were to *P. ovale* and house dust. She was found not to have a scurfy head herself, but her son suffered so severely that she had to clean his brushes every time he came home.

Case 3.—A married woman aged 55 suffered mainly from a seasonal rhinorrhoea, due to *Chenopodium* pollen, which has responded well to co-seasonal or pre-seasonal hypo-sensitization. On testing she was found to react also to *P. ovale*. She had had infantile eczema, but had a clean head herself, but remembered immediately that the aunt who looked after her as a child had a very scurfy scalp.

Case 4.—A married woman, aged 28 suffered from asthma and also from a rash on the shoulder. The rash appeared only when she wore flimsy nightdresses; if she wore a thicker one and covered up her neck the rash did not occur. She was sensitive both to *P. ovale* and to the hair-dressing used by her husband to control scurf.

Case 5.—A married woman aged 25, in addition to having true seasonal hay-fever and some hay asthma, suffered from asthma at other times, particularly in crowded stuffy rooms. She had had infantile eczema, but no trace of this remained. During the time she was under observation and before the *P. ovale* extract was available her husband's work took him away from home. Although much upset by his absence she had to record that she was "better when I see him, but worse when he's around." She was found to be sensitive to *P. ovale* but to no other mould. Again she had a clean scalp, but her husband had great difficulty in controlling dandruff.

The rash in the cases with eczema occurred not only on the head and neck but also, in some of them, on the arms, chest, back, and thighs.

Discussion

In this group of patients there are more reactions to *P. ovale* than to any other fungus and equal to those to *Cladosporium*, *Aspergillus*, and *Alternaria* taken together. Reactions to grass and composite pollens and to horse-hair, however, are much more frequent. It might have been expected that there would be a cross-reaction with animal hairs, but this has not been demonstrated. Small amounts of the mould may be present in our animal extracts, but not enough to invalidate the diagnostic tests.

There is a discrepancy between the reactions to *P. ovale* and to house dust. Samples of house dust contain ample human skin scales, yet the extract is so diluted by other elements that it can never be used as for screening. Clearly, our dust extract should be positive in all cases of animal sensitivity as well as of mould sensitivity, but in practice a fair proportion of weakly sensitive cases will not give the house dust response that could be anticipated. The skin reaction is roughly quantitative, and we have found that grouping five antigens together will bring the concentration down as far as is safe; house dust carries this dilution below the threshold, and that inconstantly, since each sample differs from the previous one. This is true of other dust extracts as well as our own.

Sensitization can occur as a single clear-cut reaction, and this also is true of the other moulds. The fact that the individual species in a genus may number hundreds makes the preparation of a general mould-spore extract improbable. The best hope would appear to be to investigate the patient's personal environment, culturing the dust, and making direct examinations for those moulds not normally growing on the media used, and limiting the mould-spore extracts to those genera found commonly in traps in the area concerned.

The treatment of *P. ovale* sensitization presents special difficulties because of the widespread contamination with it. In avoiding it special precautions have to be taken not only against house dust but also against clothing, especially outer garments which are infrequently washed or replaced, hats, the ticking of pillows, and upholstery. Ingenuity in the use of plastic sheeting as a temporary protection will be well repaid here, since few patients can afford a rapid replacement or frequent cleaning of any of these objects. It does not follow that ordinary dry-cleaning methods will remove all spores and skin scales with which textiles have been impregnated. It appears probable that the treatment should also be directed to desensitization, and that this fungus will be as rewarding as the others. The dosage should be small at first, since there is no closed season for scurf, although symptoms are worse in spring and autumn, probably from endocrine causes. The results of specific desensitization in a number of our cases will eventually be available, but a follow-up period of some years will be required before arriving at a fair judgment.

Particular care is needed in the selection of shampoos, as several patients in addition to Case 1 have become sensitized to them. Patch testing should always be done before using a fresh preparation and on the first sign of increased irritation.

Summary

Sensitization to *Pityrosporum ovale* can be confirmed by skin-testing. The mould is specific and there is no cross-reaction with any other common allergen. The source of the allergen may be the patient's own head, when there may be eczema present, or some other person's in the family, when eczema is less common and rhinitis or asthma the more usual symptoms.

REFERENCES

- Hyde, H. A., and Williams, D. A. (1949). *Nature (Lond.)*, **164**, 668.
 Frankland, A. W., and Hay, M. J. (1951). *Acta allerg. (Kbh.)*, **4**, 186.
 Stillwell, D. E., Rimington, C., and Maunsell, K. (1947). *Brit. J. exp. Path.*, **28**, 325.
 Martin-Scott, I. (1952). *Brit. J. Derm.*, **64**, 257.