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RECENT PROGRESS IN THE HOUSE DUST MITE PROBLEM

By

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After the publications of the studies (*Voorhorst et al.* 1964; 1967) in which we demonstrated that the allergenic component of house dust is a substance produced by the mite *Dermatophagoides pteronyssinus* many investigators asked us for samples of extracts of these mites for experimental purposes. The results obtained by most of them have confirmed our finding that this and other species of *Dermatophagoides* produce a very potent allergen to which very many asthma patients have become sensitized. However, many of these investigators obtained fewer positive reactions to *Dermatophagoides* than to house dust extract. We think that the reason for this discrepancy may lie in the fact that these investigators had not made the two kinds of extracts equally strong. It may be that the scarcity of the mite material induced them to keep the extracts, which are rather unstable, too long in a too diluted form. Another possible reason is the following. Although we sent all these investigators not only the mite material but also a house dust extract that could be made equally strong, many of the recipients did not follow our advice and used not our house-dust extract but one prepared by themselves. Since our standard house dust extract is rather weak, most investigators obtained more skin reactions and more "positive" provocation tests with their own generally stronger house dust extracts than with the *Dermatophagoides*-culture extract standardized to our extract. It is quite obvious that more concentrated ex-

false positive skin reactions

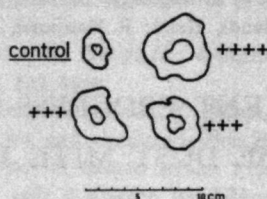


Fig. 1.

A "false-positive" skin reaction due to very strong reactions in the immediate vicinity.

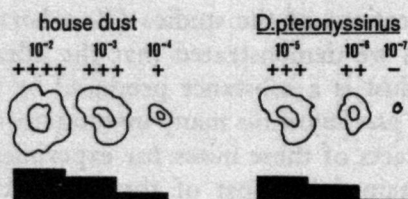


Fig. 2.

Key to diagram in Fig. 3.

tracts will give more skin reactions than the weaker ones. This holds especially for the results of *Bachofen et al.* (1967). They even used a 10 per cent Swiss house dust extract and, as could be expected, this extract produced 100 per cent "positive" skin reactions in 10 quite normal volunteers, thus proving that their house dust extract was far too strong. We can only compare house dust extract and *Dermatophagoides*-culture extract when both have exactly the same strength. The method we can recommend is always to test patients with a series of 3 tenfold dilutions of each extract. Differences in strength will then become clear (*Voorhorst* 1962 and 1966).

A second source of "false-positive" results arises when the injections are placed too close together. It is absolutely necessary that the distance between the test sites be more than 5 cm, and even then it may occur that neighbouring strong reactions make a test with an extract appear "positive" although it

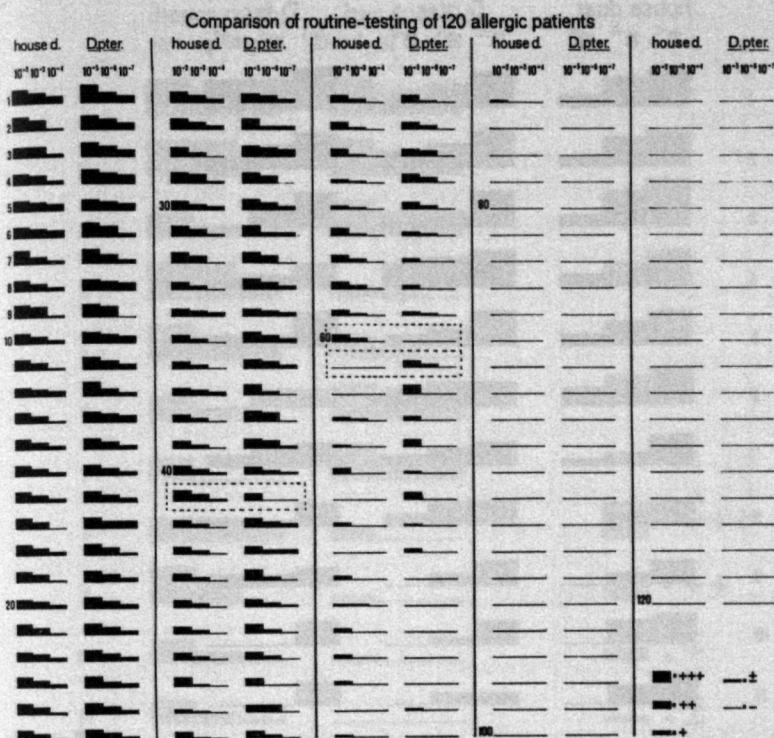


Fig. 3.

Skin reactions to house dust and *Dermatophagoides pteronyssinus*-culture extracts, obtained by routine testing of a series of 120 patients visiting our department for the first time.

would not give a skin reaction at all when tested at other places on the skin.

In the autumn of 1967 we introduced the routine use of *Dermatophagoides pteronyssinus*-culture extract in our department in three tenfold dilutions, and since then we have been able to compare the test results of house dust and *Dermatophagoides pteronyssinus*-culture extract in about 1000 patients.

Fig. 3 shows the results obtained in the first 120 patients. The key to the diagram is shown in Fig. 2.

Almost all these cases showed a good correlation, and any

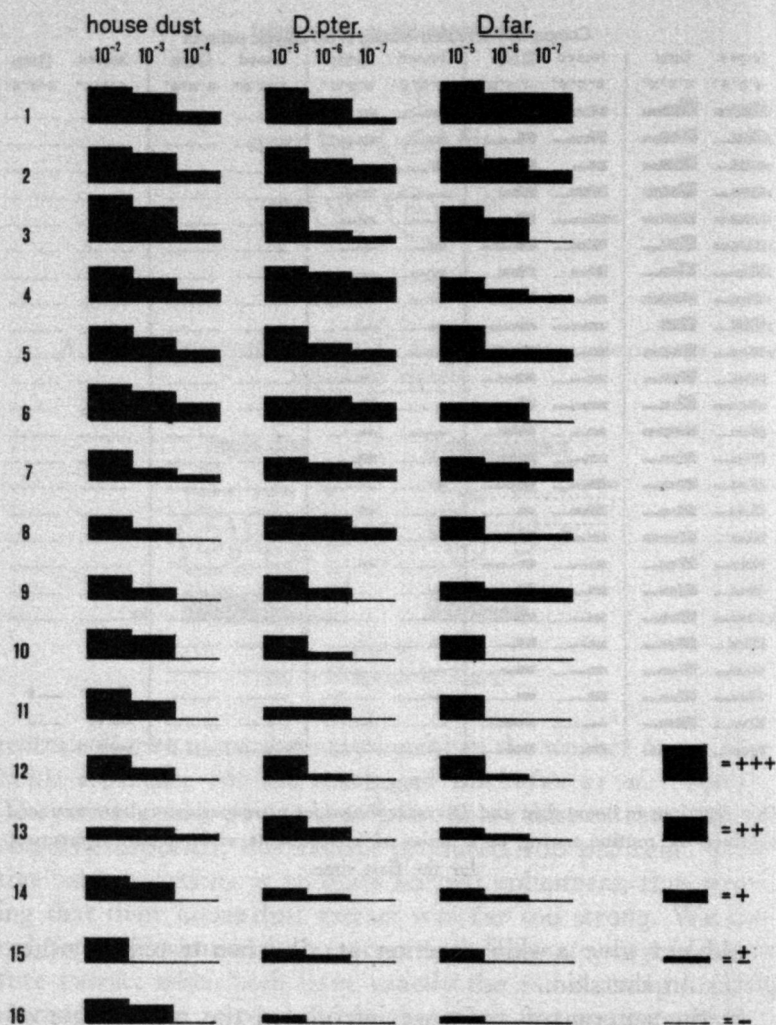


Fig. 4.

Comparison of skin reactions in 16 patients to extracts of house dust, *D. pteronyssinus*, and *D. farinae* in identical strengths.

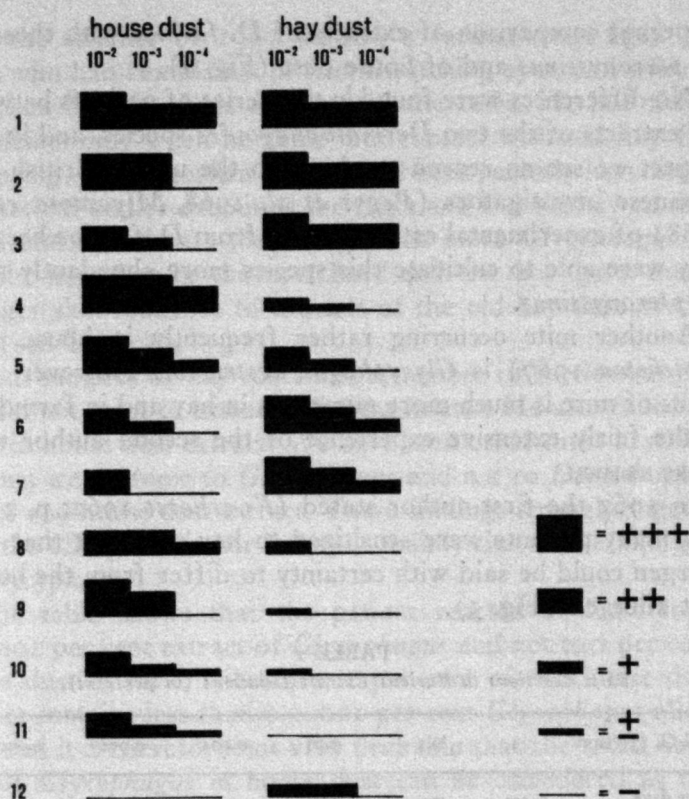


Fig. 5.

Comparison of skin reactions to house dust and hay-dust extracts in 12 patients (according to Voorhorst 1962, p. 250).

discrepancy always occurred in the group of patients with fairly or very weak reactions (patients 41, 60, and 61).

Another problem is provided by *Dermatophagoides farinae*, also called *D. culinae* by our English colleagues (Pepys *et al.* 1968). This species of *Dermatophagoides* warrants special attention because preliminary examinations done by the second author have indicated that this species occurs rather frequently in house dust, especially in dust from the U.S.A. He was able to cultivate a sufficient quantity of this species

to permit comparison of extracts of *D. farinae* with those of *D. pteronyssinus* and of house dust (Fig. 4).

No differences were found in this series of patients between the extracts of the two *Dermatophagoides* species, and in this respect we see no reason to object to the use by British and Japanese investigators (*Pepys et al.* 1968, *Miyamoto et al.* 1968) of experimental extracts made from *D. farinae* because they were able to cultivate this species more abundantly than *D. pteronyssinus*.

Another mite occurring rather frequently in house dust (*Spieksma* 1967) is *Glycyphagus destructor*. However, this genus of mite is much more numerous in hay and in farm dust, as the fairly extensive experience of the second author with it has shown.

In 1962 the first author stated (*Voorhorst* 1962, p. 250) that many patients were sensitized to hay dust, but that this allergen could be said with certainty to differ from the house dust allergen (Fig. 5).

TABLE 1
Skin Reactions to Various Extract Dilutions (in per cent).

A.G.G. 13 years	1	0.1	0.01	0.001	0.0001	0.00001
House dust	—	—	—			
<i>Dermatophagoides pteronyssinus</i>				—	—	—
<i>Tyrophagus putrescentiae</i>				+	—	—
<i>Acarus siro</i>				—	—	—
<i>Glycyphagus destructor</i>				+++	++±	++±
Hay (new) (fairly large number of <i>Glycyphagus</i>)		++	+±	—		
Hay (old) (very large number of <i>Glycyphagus</i>)		(not done)	+++	++		
Beetles		—	—	—		

In the summer of 1967 we saw a farmer's son aged 13 years who had complaints of rhinitis, itching eyes, and wheezing when he helped his father feed the cows. He had these complaints only when he came into contact with *old* hay (in the spring) and not when the hay had been recently harvested. The second author examined the fresh and the old hay on this farm, and found that there was much more *Glycyphagus* in the old hay than in the new hay, and the boy gave much stronger skin reactions to extracts of the old hay than of the new (see Table 1).

Both samples of hay contained a number of beetles but the boy did not react to extracts of these insects. He also failed to react to house dust extract. We have seen other cases in which patients were atopic to *Glycyphagus* and not to *Dermatophagoides* and house dust extract. These findings strongly suggest that the allergenic factor in hay is mainly due to the allergen of *Glycyphagus*.

The table shows that the patient reacted at least to a 0.00001 per cent extract of *Glycyphagus* and not to 1 per cent house dust extract. Therefore, 1 per cent of our house dust extract contains less than 0.00001 per cent *Glycyphagus* allergen, and it is therefore not very probable that the small number of *Glycyphagus* in house dust can be considered as the source of a minor allergen of any importance in this form, or at least not in the house dust extract we are using.

The *Dermatophagoides* allergen extracts also seem highly suitable for use in desensitization programs. First of all, these extracts are much more dilute than house dust extracts and for that reason contain far fewer non-allergen contaminants than house dust. Secondly, the former provide a very large amount of allergen per millilitre more easily than is the case for the house dust extracts. Among the many thousands of patients we have desensitized with concentrated and purified house dust extracts, we have never seen a single case of shock, although this occurs once or twice a year in the group of patients desensitized with pollen extract. This may be due to the always low allergen content of our house dust extracts (never

more than 500 equivalent units at one time). At the moment, our experience in desensitization with *Dermatophagoides*-culture extracts covers about 30 patients, all of them presently receiving 1 ml of a 0.1 per cent extract of *D. pteronyssinus* culture, or 1000 equivalent units. The solutions for desensitization are always freshly prepared from a concentrated stock solution to prevent deterioration of the allergen, especially in the stronger diluted solutions. As a rule, the process of desensitization proceeds very smoothly. We see fewer Arthus-like reactions than we were accustomed to in house dust desensitizations. However, in spite of all our caution, we have seen some severe cases of shock, in one patient 3 times.

In pollinosis, this shock is characterized by a general urticarial rash, itching of the eyes, hay-fever-like nasal complaints, coughing, and generally a not very severe attack of asthma. The clinical picture of *Dermatophagoides* shock is quite different, since most of the patients being desensitized with this allergen are asthma and not hay-fever patients. *Dermatophagoides* "shock" starts suddenly with a very severe attack of asthmatic dyspnoea. So far, no urticarial skin reactions have been seen, but we have observed swelling of the injection site, a symptom which as a rule is lacking in pollen shock, and in contrast with the latter type of shock we have seen no symptoms in the nose and the conjunctivae. We are very impressed by these sudden attacks of dyspnoea and we have reason to assume that this dangerous reaction must be feared, especially in patients with a strongly histamine-hyperreactive bronchial tree, i.e. patients with a fairly long history of asthma. Our treatment of these accidents consists of an immediate subcutaneous injection of epinephrine (0.3 ml of a 0.1 per cent solution), followed by a slow intravenous injection of an antihistamine (Sandosten calcium) and this has always been successful.

A warning seems necessary that, until further experience is obtained, desensitization treatment with *Dermatophagoides*-culture extract should only be done in well-equipped departments, with every possibility for the biological standardization of the extracts used.

SUMMARY

Since the introduction of the *Dermatophagoides pteronyssinus*-culture extract in three tenfold dilutions in the routine practice of our department we have tested about 1000 patients. A close correlation has almost been observed between the reactions to this extract and to our standard house dust extract. Furthermore, we have found that *D. farinae* (*culinae*) produces the same allergen as *D. pteronyssinus*. However, the allergen produced by *Glycyphagus destructor*, a mite occurring regularly in (old) hay (*Spieksma*), contains an allergen which differs distinctly from that of the *Dermatophagoides* species.

Our initial experience with desensitization with an extract of *Dermatophagoides pteronyssinus* in about 30 patients are reported. Although this treatment generally proceeded uneventfully, very severe side-reactions sometimes developed severe attacks of dyspnoea being the most important. These reactions seem to occur especially in patients who have not only a house dust atopy but also a strong hyperergy of the bronchial tree.

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