

## THE DANDER-ALLERGENS AS A CAUSE OF ATOPIC VASOMOTOR RHINITIS

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In the group of clinical symptoms which we are accustomed to ascribe to the reaction between atopic allergens and atopic reagins fixed to the body cells, we must distinguish two different types. The first type shows rather acute symptoms, which is the case in many patients with hay fever for instance. Sneezing, itching and watery discharge set in some minutes after the first contact with grass-pollen and stop rather suddenly after the contact has been interrupted. On the other hand we also know symptoms due to a more chronic and low-grade exposure, as is often the case in house-dust atopy. Although we may encounter the typical acute symptoms of hay fever in a number of cases of house-dust atopy, most of these house-dust sensitive persons have more chronic complaints. Eye complaints are lacking, and frequently some chronic respiratory infection is found to be the ultimate cause of the complaints. Thus the relation between exposure to the allergens and complaints becomes far from clear in many patients.

The symptoms following the contact of atopic persons with animal dander, the subject matter of the moment, resemble those of hay fever in many respects. Frequently the complaints start suddenly, for instance a few minutes after contact with a cat, and stop either after the contact has ended or after the patient has taken a sufficient amount of antihistamines. Itching of eyes and nose and symptoms of Quincke's oedema are seen frequently.

The dander allergen is present in the epidermal scales and not in the hairs themselves. Extracts must therefore be prepared only from the dander to obtain any idea of the strengths of the extracts used. If we were to prepare an extract from the hairs and dander together, the varying amount of skin scales would cause considerable differences in allergen content. The strength given for all the dander extracts we use refers to the original quantity of dander from which the extracts have been made.

As a rule we take a mixture of dander from different animals of the same species in order to get a product with a rather constant allergen content. We must keep in mind, however, that bathing the animals shortly before collecting the dander washes away the greater part of the allergen content. In this connection we must also remember that furs, rugs, horse hair, wool, and feathers do not contain any of their original dander allergen because all these biological products are treated with water in so many ways, that there cannot be much allergen left.

If these things cause allergic reactions, the reactions are caused by the house-dust allergen which has been developed within them afterwards. Some years ago we demonstrated this for old feathers obtained from pillows (Voorhorst, 1962). A second difficulty is that feathers of various birds may contain a considerable amount of mites (Spieksma), making it far from certain that positive skin-reactions to extracts of "feathers" are always due to the dander itself.

Atopic people can become allergic to dander from nearly all kinds of animals with which they come into contact. We think contact is a **conditio sine qua non**, even though it may sometimes be rather hidden, as in a case of atopy to rat dander we observed in a child of about 5 years, the exposure being caused by his mother, a laboratory worker who spent the whole day working with those rodents.

The allergological journals contain descriptions of atopy not only to the common pets and domestic animals but also more exceptional cases (Munro Ashman and Frankland, 1963).

The atopic reactions to dander allergens are rather specific. Blamoutier (1963) remarks that the allergen of horse and ass dander differ, which may possibly be the case in different strains of dogs and cats.

We have indeed been able to find considerable differences in atopic reactions to common cats and to siamese cats (Table 1).

The first patient is atopic to common cats, perhaps with a slight co-reaction to siamese cat dander. The other three patients are only atopic to siamese cat dander.

In 5 cat-atopic patients who were atopic to both common cats and siamese cats, we tested dander extracts from 6 different strains of cats. As can be seen from Table 2, all reactions show a nice sequence in strength with the only small irregularity at the bottom of column A. This can only be explained by accepting that the differences in the skin-reactions are caused by an original difference in the allergen content of the different cat danders and not by qualitative differences.

Nevertheless, it is possible that besides a common cat allergen there may also be some strain-specific allergens (siamese cats), but this can be demonstrated or excluded only after we have obtained much more experience.

Human dander in particular is a remarkable product. It will cause some astonishment to hear that atopic reactions to human dander extract are found in our patients most frequently, and as a rule first, in childhood. The allergen which follows human dander closely in sequence is the house-dust allergen.

We may ask what the reason is for such a high frequency of atopic reactions to a human product. Is it due to an auto-atopy or is there reason to consider the continuously shed skin scales as no longer belonging to the body?

The existence of the human dander allergen was discovered by Storm van Leeuwen (1922). He found that non-allergic persons seldom showed positive reactions to it, but that 90—95 % of the asthma patients did so. Although Storm van Leeuwen hesitated to declare human dander to be a true allergen, he nevertheless thought it might provide the basis for a good screening method to separate atopic from non-atopic patients. With this we can agree fully. There are very few atopic patients i.e. patients who produce atopic rea-

	Patient A				Patient B				Patient C				Patient D			
	%10	%100	%1000	%10000	%10	%100	%1000	%10000	%10	%100	%1000	%10000	%10	%100	%1000	%10000
common cat	++++	+++	+++	+	+	+	-	-	+	+	-	-	-	-	-	-
siamese cat	+++	+	-	-	++++	+++	++	++	+	+	+	-	+++	++	++	-

Table 1. Skin-reactions of 4 patients to different concentrations of extracts from cat and siamese cat dander.

	Patient A				Patient B				Patient C				Patient D				Patient E			
	total of scores	%10	%100	%1000	total of scores	%10	%100	%1000	total of scores	%10	%100	%1000	total of scores	%10	%100	%1000	total of scores	%10	%100	%1000
European shorthair	43	+++	+++	++	9	+++	+++	++	7½	+++	+++	++	9½	++++	+++	++	9½	++++	+++	++
Chestnut brown	40	+++	++	++	8½	+++	++	++	7½	+++	+++	++	8½	+++	+++	++	8½	+++	+++	++
Persian	34	+++	++	++	6½	+++	++	++	7½	+++	+++	++	7½	+++	+++	++	6½	+++	+++	+
Colour point long hair	25	+++	++	-	6	+++	++	++	5	+++	+++	++	4½	+++	+++	++	5	+++	+++	++
Manxhair	22½	+++	+	-	5½	+++	++	+	4	+++	+++	+	4	+++	+++	+	5	+++	+++	-
Abyssinian	16	+++	++	+	2½	+++	++	-	3½	+++	+++	+	2	+++	+++	+	3	+++	+++	+

Table 2. Skin-reactions of 5 patients to different concentrations of extracts from dander from 6 strains of cats.

gins, who do not react to some extent to human dander. Although atopic reactions to house dust and human dander as a rule occur together in most patients, there is no reason to believe that human dander allergen is identical to house-dust allergen, in spite of the fact that it must be admitted that house dust contains small quantities of human dander and vice versa. According to our quantitative examinations, however, the degrees of contaminations seldom exceed 1%.

Positive skin reactions to human dander are due to the presence of atopic reagins. It is very easy to perform the Prausnitz-Küstner reaction using human dander as an allergen.

The high frequency of human dander atopy is probably caused by the ubiquity of the allergen. Everyone has some amount of the allergen in his skin scales, though in variable amounts which may be determined by differences in frequency and intensity of washing or bathing.

Thus one may be atopic to his own dander. Nevertheless, we are not inclined to think that this causes many severe complaints. People who are only atopic to human dander seldom show the typical atopic complaints we are accustomed to find in most cases of atopy to animal danders. Only a number of hairdressers' apprentices have such severe complaints due to the strong exposure to this allergen that they must stop their training and in this respect human dander atopy might be called an occupational disease (Voorhorst, 1958).

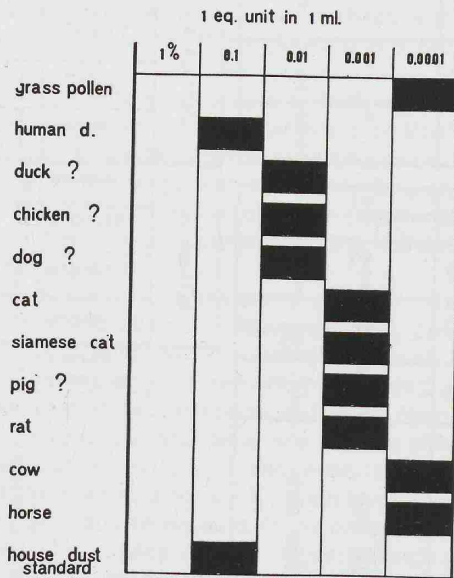


Fig. 1. Skin-reactions of a number of patients with strongest skin-reactions to extracts from different danders and from grass-pollen.

The great difference in the behaviour of human dander as compared to the animal dander allergens might be explained by some quantitative considerations. Fig. 1 lists the patients with the strongest skin-reactions to the

different dander allergens (patients with dermatographia were excluded). These skin-tests were done with a series of tenfold dilutions, and we have expressed the strength of the reactions obtained by one or more plus signs. The height of the different figures corresponds to the numbers of plus signs.

We think that using skin-tests in this way enables comparison of the potency of the different danders on an equivalent basis. Of course, the diagrams are all from different patients with different patterns of atopic sensitization. The skin-tests reproduced in these diagrams however are the strongest we have ever obtained. So we must conclude that they were caused by maximal saturation of the skin cells by the relevant reagents. And **this fact of maximal saturation** of the skin cells with reagents makes the individuals in some way comparable. It does not matter whether they are atopic to horse dander, human dander, or grass-pollen and so on; **their similarity is the maximal saturation with a certain kind of reagents** which we deduce from the maximal strength of the skin-reactions.

When we had obtained certain results with an allergen it never happened that we suddenly found a patient being 100-times more strongly atopic than previous maximally strong reactors. There is a **certain limit** in the maximal dilution of allergen extracts still causing positive skin-reactions, and this limit did not shift much after obtaining further experience with the relevant allergen.

In Fig. 1 we see what we had already expected on clinical grounds, that human dander is not a very potent allergen; rather strong extracts are required to obtain positive skin tests. Horse and cow dander, however, on an equivalent basis contain much more allergen because these test extracts can be diluted about 1000-times more.

This figure also gives the curves of 15 patients with the strongest skin-reactions to grass-pollen extracts. We see that the maximal reaction to extracts containing 1 Noon unit of grass-pollen per ml. was a +++ or a ++ skin-reaction. In the patients with maximal skin-reactions to dander extracts this corresponds to:

human dander	0.1 %
horse	„ 0.0001 %
cow	„ 0.0001 %
cat	„ 0.001 %
siamese cat	„ 0.001 %

The number of patients with skin-reactions to the other dander extracts is as yet too small to enable reliable comparison.

So we have arrived at a kind of equivalent unit of allergic activity (Fig. 2) by taking 1 Noon unit grass-pollen (= 0.0001 %) as reference. This is a very important fact. Quantitative factors in atopic allergy have been neglected too much until now.

Some of you may be wondering whether the expression of skin-test results by plus-signs has any influence on the equivalent unit. We do not think this is so, because we used the same technique to score the skin reactions for the grass-pollen reactions and the different reactions to dander extracts. Of course, it is necessary to keep your own skin-testing technique as constant as possible throughout the different years and this can only be achieved by being constantly vigilant in this respect.

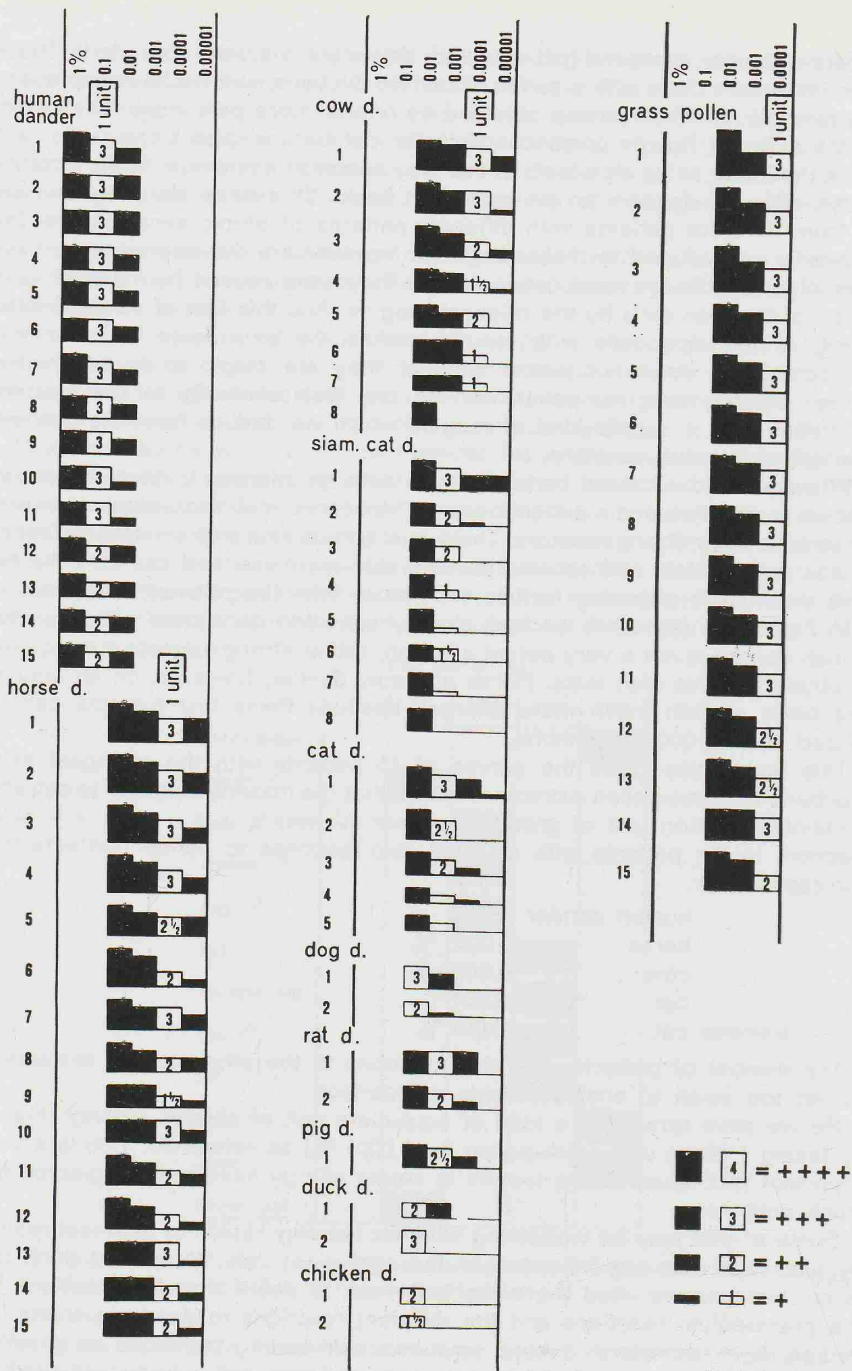


Fig. 2. Equivalent units in 1 ml of extracts from different allergens.

## RÉSUMÉ

Le facteur nocif qui est à l'origine des réactions atopiques à l'égard des animaux paraît se trouver dans les squames de la peau. Les poils eux-mêmes ne renferment pas d'allergène. Les réactions atopiques sont très spécifiques; les chats siamois ont un autre allergène que les chats ordinaires. L'allergène des pellicules humaines sensibilise la toute grande majorité des personnes qui ont une constitution atopique, mais il donne rarement lieu à des troubles sévères (apprentis-coiffeurs).

A la suite d'un certain nombre d'observations, l'auteur tire des conclusions qui l'ont amené à exprimer l'activité des extraits d'allergènes en «unités équivalentes».

## REFERENCES

- Blamoutier, P.; 1963. Quelques curieux cas d'allergie à divers poils d'animaux. *Rev. Franç. d'Allergie*, 3-115.
- Munro Ashman, D. and A. W. Frankland; 1963. Sensitivity to deer scurf. *Act. Allergologica*, 18—168.
- Storm van Leeuwen, W.; Z. Bien and H. Varekamp; 1922. Zur Diagnose der Überempfindlichkeitskrankheiten. *Münch. Med. Wsch.*; 69—1690.
- Voorhorst, R.: 1958. The human dander allergen in: *Occupational Allergy*, p. 260. Ed. Stenfert Kroese, Leiden, Holland.
- Voorhorst, R.; 1962. *Basic Facts of Allergy*. Stenfert Kroese, Leiden, Holland.

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