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## HUMAN DANDER AND ATOPIC DERMATITIS<sup>1</sup>

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In 1922, Storm van Leeuwen and his associates stated that when tested intracutaneously with human epithelium, 90 per cent of their asthma patients presented positive reactions (1). In non-allergic subjects the test was invariably negative. With this method, it was thought, a procedure had been discovered of diagnosing allergy. Although these observations were verified by some other authors, more recent reinvestigation in America as a rule did not yield corroborative evidence.

It seemed reasonable also to test patients suffering from atopic dermatitis with this allergen, and as early as in 1924 Keller reported that among 21 patients with "*spät-exsudatives Ekzematoid*" every one had responded with a positive immediate reaction (2). The controls were positive in 10 per cent.

The author who has most closely studied this problem is Simon. Since 1944 he has written several papers dealing with the so-called "human dander" allergy associated with infantile pruriginous eczema and atopic dermatitis (3,4,5,6,7). Apparently he also was the first to adopt the patch test technique for tests of this kind.

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<sup>1</sup>A paper read at the meeting of the Swedish Society of Allergology, Nov. 16th, 1953.

According to Simon, the results which he obtained when testing children and adults suffering from atopic dermatitis, can be summarized as follows. (1) Scratch and intracutaneous tests with human dander evoke urticarial reactions in adults but not children. The incidence rate of positive reactions, urticarial in type, to human dander is far higher in patients with atopic dermatitis than in normal subjects or those suffering from hay-fever and asthma. (2) Patch tests with human dander will be positive in children, though less frequently in adults. The rate of positivity is much higher in children with pruriginous eczema than in normal subjects or patients with hay-fever or asthma. (3) "Scratch-patch" tests (the patch test is made in an area previously scarified) with human dander will often evoke responses in adults and older children negative to the ordinary patch test.

As a rule the reactions following patch tests with human dander are milder than those seen in patients sensitive to common contact allergens such as mercury or chromium. In addition, there are some other differences. Nexmand, who in his study of atopic dermatitis also has carried out patch tests with human dander, gives the following description of the response: "The patch test response to human dander appears about twenty-four hours after application and consists of follicularly localized papules, either on apparently normal skin or in a slightly reddish and scaly area. As a rule the reaction fades away in the course of 48 to 72 hours, but in a few instances it persists as an infiltrated, red, slightly scaly spot for several days. Strong reactions bear a striking resemblance to the primary lesions in an eruption of Besnier's prurigo" (8). Simon calls such a positive human dander reaction an "atopic reaction".

By his investigation of the allergen content of different regions of the integument Simon showed that the maximum amount of human dander allergen is present in the epidermis of the scalp. On the other hand, sparse amounts could also be found in the epidermis at other sites as well as in hairs of the scalp, pubic region, and axillary fossa. The allergen was

soluble in water but not in fat. In Simon's opinion it was formed in the epidermis, viz. in the stratum granulosum and stratum lucidum, where cellular degeneration took place.

A point of particular interest is, that Simon succeeded in demonstrating human dander allergen in the epidermis of a new-born infant. From this fact he argues that it cannot be extrinsic in origin, e.g. a micro-organism or another extraneous factor such as, for example, dust. Further, it is of interest to note that he has seen a patient who responded to an allergen prepared from his own epidermis. This patient even had circulating antibodies to the allergen. These are some of the findings which in Simon's opinion were evidence in favour of atopic dermatitis being due to an allergic reaction to an allergen derived from the patient's own epidermis.

If this were true, that is if merely the superficial contact between skin and dandruff were a factor of distinct aetiological significance in atopic dermatitis, successful treatment, perhaps even complete cure, of the condition might be achieved by restricting exposure to the allergen. However, since this allergen abounds wherever man resides, there would seem to be little if any hope of avoiding contact with human dandruff. None the less by various procedures Simon has made the experiment of protecting a number of children with pruriginous eczema and positive human dander test for a certain period from exposure to their own, their parents', and other persons' dandruff. The series studied by Simon comprised 21 children in all, 2 of whom were cured and 8 improved. Since controls are lacking and the series is so small, there is scarcely any evidence of the prophylactic measures against human dander exposure being instrumental in the improvement noted in a proportion of patients.

Where it is a question of deciding whether an allergen producing a positive skin test is of aetiological significance in a given case, the exposure test ranks first among the procedures adopted to this end. Provided that other aetiological factors can be ruled out, perhaps it may be interpreted as a positive exposure test if e.g. in an atopic dermatitis patient

with positive human dander reaction sexual intercourse is followed by an exacerbation of the condition. Such observations, however, seem to be exceedingly rare. Thus, in the literature available I have found only two case reports where such a connexion was suggested. In the following I shall briefly survey these two instances recorded in the literature and add another, similar case, which has for a considerable period been under our care at the Department of Dermatology of Karolinska Sjukhuset.

The first case was described by Bartlett in 1949 (9). The patient was a woman aged 28, who during childhood had suffered from atopic dermatitis, which subsided at the age of 15. When the patient was 18 she developed hay-fever. Some time later she became engaged to be married. The patient then suffered a mild recurrence of her dermatitis involving the face; after her marriage in the following year, she had a severe exacerbation, the dermatitis extending on to the limbs and trunk. Intracutaneous tests disclosed sensitivity to dust, feathers, and some other agents; patch tests were positive with several cosmetics, *inter alia* the brilliantine used by the patient's husband. All cosmetics were removed from the environment, and the patient was desensitized with the allergens evoking responses in the intracutaneous tests. Under this management the hay-fever improved, but there was no benefit to the skin.

During the war the husband was called up for military service. The eczema of the patient then began to recede, and when the husband had been absent for slightly more than a month, her skin was completely normal. However, each time when her husband was at home on leave, she experienced a violent recurrence of her dermatitis. The patient was then tested with the husband's epithelium, to which she proved to be sensitive in patch and intracutaneous tests. On the other hand, tests with various stock antigens of human dander were negative. Treatment was instituted with extract prepared from the husband's epithelium, and after a year's treatment the patient was comfortable.

The second case was in 1950 presented by Kaalund-Jørgensen at a meeting of the Danish Dermatological Society (10). A woman of 22 since childhood had suffered from atopic dermatitis. In 1946 and 1947 she became engaged. During the whole time the skin lesions had remained more or less stable. In

1948 she was fairly comfortable, but in 1949 she had to undergo treatment for an acute outbreak. At that time she had another fiancé, and she had herself the distinct impression that each contact with her betrothed resulted in a violent exacerbation of her condition. The more intimate the contact, the more severe the recurrence; there was no difference whether the meeting had taken place in her own or her fiancé's home. A scratch test with the partner's epithelium produced a strongly positive reaction with violent itching. The test with her own epithelium was negative. A test with Dr. Kaalund-Jørgensen's epithelium was positive, but far less strongly than that with epithelium of the fiancé. The patient was advised against meeting the man, and there was no further recurrence of her dermatitis.

### CASE REPORT

Our own observation relates to an office clerk from the provinces, aged 47 (H. 1049/53 S.L.), who had had infantile eczema in early childhood and recurring atopic dermatitis as well as bronchial asthma since the age of 18. The dermatitis, which earlier had been moderate in degree, involving only the face and the bends of the elbows and knees, in the course of the last two years became much more severe, so that at times the patient practically presented the picture of generalized erythroderma. As a rule these violent outbreaks were preceded by acute conjunctivitis. Following this grave development of his condition more than two years ago, the patient had been completely incapacitated and required nearly continuous hospitalization. Thus, from March, 1952, onwards he had in five separate periods been treated as in-patient at the Department of Dermatology of Karolinska Sjukhuset. After about a week or two in hospital the symptoms usually receded, and after a couple of weeks the skin as a rule was practically normal. When the patient went home, after but a day or two his symptoms unfailingly reappeared and were as distressing as before. On admission to hospital for one of his relapses, the patient usually presented the following picture: The entire skin was erythematous, thickened, and in parts lichenified. Within certain areas an eruption was noted consisting of small, red papules more or less destroyed by scratching. In the bends of the limbs and on the chest the skin as a rule was oozing. The eczematous changes were most pronounced in the facial area, where infection was apt to supervene, and which at times was covered with extensive dry crusts. Commonly there was violent conjunctivitis with considerable palpebral oedema (Fig. 1). Though the asthma for the last two years had been increasing in severity, it did not exacerbate simultaneously with the dermatitis.

If instead of returning to his home, the patient after discharge from hospital stayed with friends in Stockholm or went to live with his brother whose home was only a few kilometres

distant from that of the patient, he remained comfortable. Believing the dermatitis to be due to dampness or other factors connected with the locality, the patient moved into another flat in his home town. However, once he had settled



*Fig. 1.*

Typical picture of patient when admitted to hospital for one of his recurrences (writer's case).

there, the symptoms reappeared as soon as in his old flat, and were as grave as before.

We asked the patient to collect dust in his rooms and carried out intracutaneous tests with this material, but this did not evoke a response. In addition we tested the patient with the ordinary food and inhalant allergens. He proved sensitive to fish and fruit extracts, but otherwise did not present positive reactions. There was nothing in the history

to suggest that these substances provoked an exacerbation of the dermatitis, nor did improvement ensue when the patient avoided them for a considerable period. Patch tests with the ordinary contact allergens were negative. The usual laboratory examination failed to reveal any abnormality except there were up to 19 per cent eosinophils in blood films.

When questioned as to his own suspicions concerning a possible reason for the exacerbation of his condition, the patient stated confidently that "it occurred when G. entered my home". "G." is a woman of 34 whom the patient in July, 1951, engaged as his housekeeper. Three weeks later he had the first attack of his conjunctivitis and the first violent outbreak of his dermatitis. The housekeeper is still living with the patient, and the two of them have a child together, who is now  $1\frac{1}{2}$  years old.—It should be mentioned that never before had the patient experienced any exacerbation of his dermatitis after intimate contact with other women.

Hypersensitivity to a cosmetic used by the housekeeper seemed at that stage a plausible explanation of the outbreaks of dermatitis. On the other hand, the woman used hardly any cosmetics at all, viz. no powders, and lipstick only very occasionally. She never dyed her hair. Formerly she had been in the habit of washing her hair with the shampoo, "Sunsilk", but she substituted "Palmolive-Shampoo" during the last year. When the patient was tested with both shampoos he proved negative to the former but positive to the latter. Tests with the ordinary washing-powders were negative. That the latter shampoo was aetiologically significant in this instance seemed improbable for two reasons, viz. first, the increase in severity preceded the use of the shampoo by  $1\frac{1}{2}$  years, and second, during the last year the patient himself had repeatedly used this shampoo without untoward effects. Tests with lipstick, which were also made, were negative.

The possibility was then considered of this being a case of human dander allergy, and the patient was accordingly tested with the housekeeper's hair. Intracutaneous tests with extract (1:100) prepared from the hair were negative, but

patch tests with hair gave a positive reaction (Fig. 2). The response was most marked at the second and third readings and was of the "atopic reaction" type, viz. abundant follicular papules within an erythematous area. The reaction persisted for more than a month as a violently itching eczematous lesion very similar in appearance to the patient's dermatitis in general.

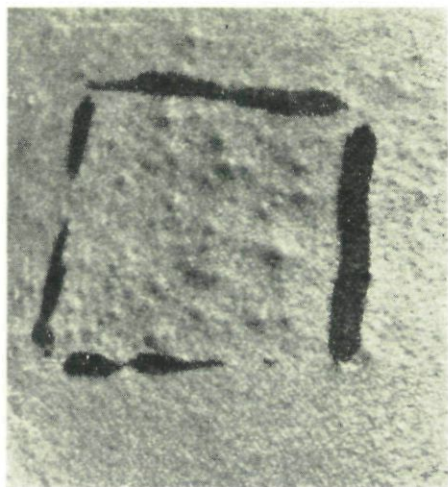


*Fig. 2.*

Response to patch test with hair of "Miss G."  
(writer's case).

A biopsy specimen taken from the test site 48 hours after removal of the dressing disclosed the essential features of acute eczema (H. 820/53). The epidermis was of normal thickness. In one field superficial fibrinous exudation was noted within the slightly thickened horny layer, which contained cellular nuclei. In the surface and follicle epithelium, there was in some areas fairly ample, principally extracellular, oedema with occasional transmigrant cells. Within the upper third of the corium oedema was observed and moderate cellular infiltration about the vessels, consisting chiefly of lymphocytes and histiocytes.

The Prausnitz-Küstner test, i.e. the conventional intracutaneous procedure, was positive.

We also tested the patient with his own hair and that of the ward sister. These tests were negative, but miscellaneous hair collected from five other persons gave a weakly positive reaction.

Further, for control purposes ten other patients with atopic dermatitis were tested with the housekeeper's hair. Out of seven adults two responded with weak reactions, and two children out of three presented clear responses. The remaining were definitely negative. Among ten adults with other diseases two displayed weakly positive reactions. One of the latter had asthma, the other psoriasis. In the remaining eight the test was negative.

#### DISCUSSION

All of the cases just described concern patients giving histories typical of atopic dermatitis (prurigo of Besnier), presenting positive human dander reactions, and experiencing exacerbations of the dermatitis after sexual intercourse with their respective partners.

Before considering the question of whether or not the human dander allergen is aetiologically significant in a given case of this type, it is necessary, in the first place, if possible to rule out that the patient is sensitive to a cosmetic used by the partner. Dermatitis is not infrequently due to this type of sensitivity. As in instances of so-called contact dermatitis evoked by other agents, the involvement as a rule is rather closely limited to the areas which have been in direct contact with the allergen. Having met with instances where newly-married couples had to interrupt their wedding-trip because the husband developed more or less widespread dermatitis after contact with the bride's perfumed skin, Waldbott uses the term, honeymoon-dermatitis, to denote eczema of this type (11).

Even if it is considered possible to rule out sensitivity to a cosmetic as an aetiologic factor, one should naturally be

careful in drawing conclusions. For example, when dealing with instances of this kind so-called psychosomatic factors cannot be excluded, as these are certainly of considerable importance in many skin diseases, not least atopic dermatitis.

If then human dander allergy actually is an aetiological factor of significance in atopic dermatitis, the question arises whether the sensitivity is restricted to the epithelium of only one or a few persons, or comprises human dander in general. In Bartlett's opinion a special human dander was implicated in the case observed by him. His patient responded exclusively to an extract prepared from the husband's epithelium and was negative to a miscellaneous extract. In the two remaining cases, viz. that recorded in Denmark and our own, positive reactions were obtained in tests with epithelium from the partner involved as well as with epithelium from other persons, though the latter reactions were weaker. On the other hand, both patients previously had other intimate relations without deleterious effects to their dermatosis.

Evidence against a strictly specific human dander allergy as that presumed by Bartlett in his case is perhaps furnished by the observations concerning allergy to the epithelium of domesticated animals, where group allergy is common (12). For example, a patient allergic to kitten epithelium is apt to be sensitive also to leopard, etc. A certain degree of specificity, however, is sometimes noted, viz. in respect of allergy to dog epithelium, where one race only of dogs may be responsible (13).

Some interesting facts concerning human dander and urticaria were observed by Waldbott (14). His observations relate to two women in whom contact with human hair produced localized urticaria. Both were allergic subjects suffering from eczema and asthma respectively, who exhibited positive skin reactions to many antigens. In the patient with eczema, contact with her husband's skin, especially at the time when he was perspiring, produced localized hives. The other developed general urticaria upon the husband's entry into the home. Patch and intradermal tests with an extract of the hair showed

strongly positive reactions, while control tests with other hair and substances applied to the hair (cosmetics) were negative. The aetiological significance of the human dander allergy seems fairly obvious in these two cases of urticaria; it is also probable that the hypersensitivity was specific. Waldbott's observations may therefore be taken to support the opinion that similar aetiological connexions may also occur in atopic dermatitis.

#### SUMMARY AND CONCLUSIONS

1. There is evidence to show that sensitivity to human epithelium actually exists. It is considered to occur more frequently in cases of infantile eczema and atopic dermatitis than in association with other allergic conditions.

2. At present, definite evidence is still lacking as to whether this type of allergy is aetiologicaly significant to the above dermatoses.

3. In the three cases of atopic dermatitis (two recorded, one observed by us) quoted in the present paper, sensitivity to the partner's epithelium may have played an important part in provoking the recurrences. Hence, where it is a question of tracing the allergen in obscure cases of this condition, human dander should be suspected if the history does not contradict this suspicion.

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