

Immunological partial identity between animal allergens

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Immunological partial identity between allergen sources is due to common molecular parts in the various sources; and patients having IgE against identical epitopes on these molecular parts do contain cross-reacting IgE antibodies.

The distribution of a patient's IgE clones reacting towards common and unique epitopes from two immunologically partially identical sources will define the degree of »cross-reaction» that the patient will recognize, but for the patient and the tester it cannot be determined if the reaction is due to the cross-reacting IgEs or unique IgEs found also in patients with independent, multiple allergies, unless RAST – or CRIE – inhibition experiments are performed.

The degree of immunological partial identity between one source related to another is determined by the ratio of number of common epitopes and total number of epitopes, provided the affinity constants for the epitopes reacting with the antibodies are identical.

In the following the present knowledge about common molecular parts among related sources of animal origin will be discussed on the basis of experiments using sera from animals and man. This information reflects the probability that a patient reacting towards one allergenic source will also react towards the related one and in that way contribute to the »cross sensitivity».

Rodents. The immunological partial identity among rats, mice and guinea pigs has

recently been investigated (1). RAST inhibition experiments showed a clear relation between allergens from rat and mouse and a somewhat weaker relation between these two and guinea pigs. It was proposed (although not shown) that part of this immunological partial identity was due to degraded serum proteins present in the animal urine. More important was, however, the results obtained by CLIE directly showing immunological partial identity between non-serum derived urine components of each species e.g. rat urine pre-albumin and α_2 -globulin components molecularly related to the corresponding components of the mouse.

Similar, but weaker, immunological partial identities were shown between the mouse pre-albumin and the allergenic pre-albumin of the guinea pig, but not between rat and guinea pig urine components. There is therefore evidence for weak partial immunological identity between some of the major allergenic urinary proteins of rats, mice and guinea pigs although these molecules also contain a high degree of unique epitopes. This weak partial identity may contribute to the »cross sensitivity» found during skin testing and RAST testing of patients allergic to laboratory animals (2). No relation concerning immunological partial identity to the suborder comprising ground-squirrel (chipmunk) and beaver has so far been studied.

Studies concerning molecular relations between the order including hare and rabbit

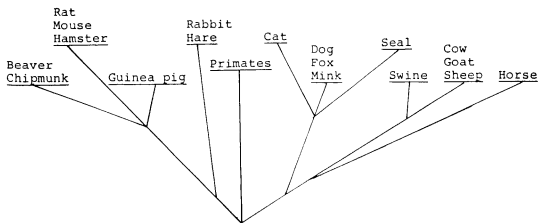


Fig. 1. The phylogenetic relation between some animals of allergic relevance in the Nordic countries (from Peter Lind).

have not been performed so far but a certain immunological partial identity can be expected.

The order comprising cat; dog, fox, mink; and seal consists of three different suborders, and especially the allergenic relation between cat and dog has been investigated. Among the twelve cat allergenic molecules detected in cat hair and dander two of these – cat Ag 3 (albumin) and Ag 8 – were found to be immunologically partially identical to antigens derived from dog hair and dander (3). The experiments were performed by means of CLIE and it was also shown that both these allergens were serum proteins but were also present in saliva and urine. Among the eleven allergenic molecules detected in dog hair and dander, Ag Nos. 2 (albumin), 6 and 20 were found to be immunologically partially identical to various cat antigens by means of CLIE (3). These allergenic molecules were all present in serum. Relations between antigens from dog to antigens from fox and mink have not been studied but can be expected; and immunological partial identity between seal antigens towards antigens from the other two suborders have not been studied. Since none of the antigens from cat and dog sharing common molecular parts are major allergens, the probability of pa-

tients having identical IgEs reacting towards both sources is rather low – but real, and this weak partial identity may contribute to the »cross sensitivity» generally found.

Cow hair and dander contained eleven allergenic molecules and among these the epithelium-derived antigens Nos. 1, 3 and 4/6 are immunologically partially identical to antigens from goat and sheep dander. Surprisingly, Ag 1 was shown to be related to an antigen of cat dander! Ag 20 (immunoglobulin) is related to serum proteins (probably immunoglobulins) from goat, sheep, swine (and humans). Ag Nos. 1, 3 and 4/6 were present in saliva and urine (3, 4). The relation of these antigens to antigens from reindeer has not yet been studied but immunological partial identity can be expected. This partial identity may contribute to the experienced »cross sensitivity» found for patients allergic to cow, goat and sheep. Finally, it should be added that an overwhelming immunological partial identity has been found between the milk proteins (including the major allergens β -lactoglobulin, α -lactalbumin and albumin of cow and goat (5).

Horse hair and dander contains 15 antigens identified as allergenic molecules. Ag Nos. 6, 9, and 11 – all derived from epi-

thelia but also present in urine – have previously been shown to be immunologically partially identical with antigens from cat, cow and guinea pig and Ag Nos. 6 and 9 also with antigens from dog (3, 6), but a recent re-investigation of these relations could only verify the surprising relation between the major horse allergen, Ag No. 11 and an antigen from guinea pig.

It is remarkable that the immunological partial identity which has been detected is caused by the serum-derived proteins as compared to proteins from dander which seem to be suborder specific and also to contain the major allergens. Usually immunological partial identity has only been recognized within the suborder or order of the various animals but exceptions from this relationship have been found.

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