

Crystal structure and epitope analysis of house dust mite allergen Der f 21

ABSTRACT

Group 21 and 5 allergens are homologous house dust mite proteins known as mid-tier allergens. To reveal the biological function of group 21 allergens and to understand better the allergenicity of the rDer f 21 allergen, we determined the 1.5Å crystal structure of rDer f 21 allergen from *Dermatophagoides farinae*. The rDer f 21 protein consists of a three helical bundle, similar to available structures of group 21 and homologous group 5 allergens. The rDer f 21 dimer forms a hydrophobic binding pocket similar to the one in the Der p 5 allergen, which indicates that both of the homologous groups could share a similar function. By performing structure-guided mutagenesis, we mutated all 38 surface-exposed polar residues of the rDer f 21 allergen and carried out immuno-dot blot assays using 24 atopic sera. Six residues, K10, K26, K42, E43, K46, and K48, which are located in the region between the N-terminus and the loop 1 of rDer f 21 were identified as the major IgE epitopes of rDer f 21. Epitope mapping of all potential IgE epitopes on the surface of the rDer f 21 crystal structure revealed heterogeneity in the sIgE recognition of the allergen epitopes in atopic individuals. The higher the allergen-sIgE level of an individual, the higher the number of epitope residues that are found in the allergen. The results illustrate the clear correlation between the number of specific major epitope residues in an allergen and the sIgE level of the atopic population.

Keyword: Dust mite; Allergen; Der f 21; Immunoglobulin E (IgE)