Structure and Dynamics of Allergen Gad m 1 in complex with IgE antibodies by NMR Spectroscopy

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Allergenic proteins are able to stimulate an inappropriate IgE production in predisposed atopic individuals, which results in manifestations of clinical symptoms such as asthma, rhinitis and atopic dermatitis. Allergen vaccine design includes the production of modified allergen molecules with a low-affinity for allergen-specific IgE. Gad m 1 is the major allergen from Atlantic cod and belongs to β-parvalbumin protein family, which is characterized by the presence of two calcium-binding sites so called EF-hand motifs. β-Parvalbumins are the most important fish allergens and their high cross-reactivity is the cause of the observed polysensitization to various fish species in allergic patients. Despite extensive efforts, the complete elucidation of β-parvalbumin-IgE complexes has not been achieved yet. In this work, we used NMR spectroscopy to determine the solution structure of Gad m 1 and to characterize it in complex of IgE variable fragment (scFV). Four epitopes were mapped: three of them correlate with epitopes in other parvalbumins but the epitope in the C terminal was only identified in Gad m 1 and in carp parvalbumin. This work will present for the first time the NMR structure of a β-parvalbumin as the first and crucial step in the development of hypoallergenic vaccine and understanding of the molecular interactions between allergens and IgE’s.

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