A smart allergen: Studies of Bet v 1 dynamics and its interaction with human IgE by NMR

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Allergens that lead to type I allergic reactions affect approximately 30% of adults and up to 40% of children in Western Societies. Betula verrucosa allergen (Bet v 1, 17.5 kDa) is one the major causes of pollinosis in the Northern Hemisphere. In this NMR study, we characterized the interaction between Bet v 1 and IgE purified from sensitized human patients. Combining all NMR information we could map two faces of the protein that showed surface residues perturbed by the interaction with IgE. The regions around residue 24 and 70 were recognized by IgEs from two different patients. Very interestingly those regions match two peptides previously identified, capable of competing with patients’ IgE for Bet v 1 binding. The Bet v 1 dynamic behavior is very complex, not only chemical shift changed in the presence of IgE, but there was also a profound change in line width, which is very informative about dynamics. Since Bet v 1 became more ordered in the presence of deoxycholate, we analyzed the interaction of the Bet v 1 with IgE and deoxycholate in an attempt to find the hot spots for IgE interaction. This complex dynamic behavior of Bet v 1 had hampered the development of an efficient vaccine for this allergen. Our strategy allowed the decrease in mapped residues and may contribute to the development of hypo-allergenic variants for novel approaches to allergen-specific immunotherapy for Bet v 1 and analogous allergens.

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