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POINT OF VIEW

Why can patients with baker's asthma tolerate wheat flour ingestion? Is wheat pollen allergy relevant?

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Abstract

Diagnosis in patients sensitised to multiple pollens is difficult due to the relationship between pollen and food allergens. Misdiagnosis is often a cause for unsuccessful specific immunotherapy. Wheat is a potent allergen source and is one of the causes of baker's asthma, food and pollen allergy. Recently, we have performed a study on pollen sensitisation in our area, where cereal crops are very important. The clinical data from 19718 patients reviewed showed that grass pollen was the main source of clinical symptoms (6369 patients, 32.30% of asthmatics). However, wheat and cereal crop pollen showed very low prevalence. On the other hand, patients with wheat flour allergy after ingestion and/or with baker's asthma were not sensitised to wheat pollen, despite it containing some common allergens. In the same way, all our asthmatic bakers (135 patients) tolerated the ingestion of bread. Here we try to explain the reason for these surprising observations.

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Wheat is a potent allergen source and is one of the causes of baker's asthma, and food and pollen allergy.¹ Recently, we have performed a study on pollen sensitisation in our area, where cereal crops are very important. The prevalence of wheat pollinosis should be expected to be very high due to the level of this pollen.

We reviewed and analysed the data from 19,718 patients who were admitted to our Allergy Unit between 1989 and 2009. All the patients underwent allergy tests to identify allergens and asthma risk-factors. The clinical data revealed that spontaneous grass pollen was the principal source of clinical symptoms (6369 patients, 32.30% of asthmatics). However, wheat and cereal crop pollen showed very low prevalence of clinical symptoms (0.20% as cause of rhinitis and asthma).

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On the other hand, patients with wheat flour allergy after ingestion and/or with baker's asthma were not sensitised to wheat pollen, despite it containing some common allergens. Only 0.05% of those patients suffered from grass pollen allergy. In the same way, all our asthmatic bakers (135 patients) tolerated the ingestion of bread. The reason for these surprising observations was difficult to explain.

Most of the patients with baker's asthma in different surveys^{2,3} did not present wheat food allergy. A different via of sensitisation (inhalation versus ingestion) and allergenic source (wheat flour versus processed wheat foodstuffs) could explain this fact, although some wheat allergens, like α -amylase inhibitors or lipid transfer proteins, are implicated in both types of allergy^{4,5} and in some cases of celiac disease as recently published by our group.⁶ The allergenicity of foods⁷ could be modified by heat and other treatment. Most studies on wheat food allergy have been performed with raw flour, although raw wheat flour is rarely consumed. Thus, the effect of heat treatment during processing or cooking was not taken into account on the IgE-binding capacity of potential wheat allergens. Recently, using extracts from wheat-derived foodstuffs (French bread, wholemeal tin loaf bread, toasted bread, pasta, biscuits, pizza, baby cereal food and breakfast cereals), we have found that this processing of these foods seems to greatly decrease the IgE binding capacity of the major salt-soluble proteins. Moreover, the simulated gastric fluid digestion could further inactivate some heat-resistant potential allergens.^{8,9}

On the other hand, these bakers can usually consume bread and wheat-derived foodstuffs during all their life without problems. Their symptoms begin with the inhalation of wheat flour, probably due to a change in target immune receptors. IgE sensitisation to soy and wheat is classified as "primary" when it is generated by food ingestion and as "secondary" when it is a consequence of primary sensitisation to cross-reacting pollen antigens via inhalation. In a German multi-centre longitudinal study, in which 1314 children were followed from birth to age 13, IgE sensitisation to wheat and soy were uncommon. In early infancy, those types of sensitisation were mostly primary, while they were secondary at school age.¹⁰ In our patients, wheat flour sensitisation did not seem secondary to wheat pollen inhalation. Perhaps the cereal ingestion may be acting like an oral tolerance mechanism, similar to oral immunotherapy. In a recent study on tolerance mechanisms in response to antigens responsible for baker's asthma,¹¹ we found that the presence of higher levels of IgG₄, IL10 and sub-clinic grass-pollen sensitisation may have helped to develop a kind of natural hyposensitisation.

In summary, the diagnosis in patients sensitised to multiple pollens is made difficult by the relationship

between pollen and food allergens. Misdiagnosis is often a cause for unsuccessful specific immunotherapy.¹² Epidemiological analysis by molecular component-resolved diagnosis is a new method which may elucidate the interaction between allergen exposure gradient and patient sensitisation. High pollen exposure is not always associated with more severe allergic conditions. Serological studies using micro-arrayed wheat seed and grass pollen allergens for the discrimination of baker's asthma, wheat-induced food allergy, and grass pollen would be very useful.¹

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