

CASE REPORT

Occupational rhinitis caused by concurrent sensitization to two different allergens

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Background	Exposure to wheat flour and guar gum is a well-known cause of occupational respiratory allergies among workers in the food processing industry. To date, there have been no reports of occupational rhinitis (OR) caused concurrently by two different allergens present in the workplace.
Aims	To report a case of OR likely to be induced concurrently by exposure to wheat flour and guar gum in a mid-40s male employed in the food processing industry.
Methods	Allergy tests and nasal challenge tests were performed to investigate and confirm the diagnosis of OR. We discuss potential mechanisms involved in the observed dual sensitization.
Results	The patient showed positive responses to wheat and guar gum extracts on skin prick testing. The total IgE was 1680 kU/l (0–100 kU/l). The diagnosis of OR was confirmed by nasal challenge tests with wheat flour and guar gum on different days. In contrast to the control day, the challenge with flour and guar gum induced an immediate clinical reaction associated with a decrease in nasal volume measured by acoustic rhinometry. The patient was advised to avoid exposure to wheat and guar gum, which resulted in a gradual resolution of nasal symptoms.
Conclusions	Co-sensitization and cross-reactivity are possible mechanisms involved in cases of concurrent sensitization to related and unrelated allergens in patients complaining of work-related rhinitis symptoms.
Key words	Allergy; occupational respiratory disease; occupational rhinitis; rhinitis.

Introduction

In high-risk industries for respiratory allergies, workers are frequently exposed to several allergens with the potential to cause occupational rhinitis (OR) and occupational asthma (OA) [1]. Bakery workers are potentially exposed to allergens such as various cereals, moulds, fungal enzymes, egg and milk proteins, and storage mites. Wheat flour exposure can affect workers in bakeries, flour mills and food production companies. Guar gum is a natural, high molecular weight carbohydrate obtained from the guar plant that has widespread use in the food industry as a thickening and binding agent. Exposure to wheat flour and guar gum is a well-known cause of OA and OR. We report a first case of allergic OR likely to be induced concurrently by two different occupational allergens, which was confirmed following current international recommendations [2].

Case report

A mid-40s male never smoker was referred to our hospital with a 7-month history of nasal obstruction, rhinorrhea,

sneezing and itching. He also complained of nasal crusting and pharyngeal symptoms including sore throat and throat dryness. His nasal and pharyngeal symptoms were worse at work but improved over weekends and holidays. He had worked in the food processing industry for 7 years, during which he was mainly exposed to different cereals, milk proteins, starch and guar gum. The only relevant medical antecedents were a history of diabetes and asthma-like symptoms. He was using an inhaled corticosteroid, beta-2 agonist and oral antihistamine to control respiratory symptoms.

Physical examination revealed swollen, pale nasal mucosa and turbinates, but it was otherwise unremarkable. He was atopic as demonstrated by a positive skin prick test to mixed grass pollen, mixed tree pollen, *Alternaria* and horse epithelia. Besides, skin prick tests were positive to wheat flour and guar gum that he handled at work. The serum total IgE level increased to 1680 kU/l (0–100 kU/l); specific IgE levels to wheat flour and guar gum were not measured. With these results, a diagnosis of probable allergic OR caused by wheat flour and guar gum was considered. A nasal challenge test using acoustic rhinometry was

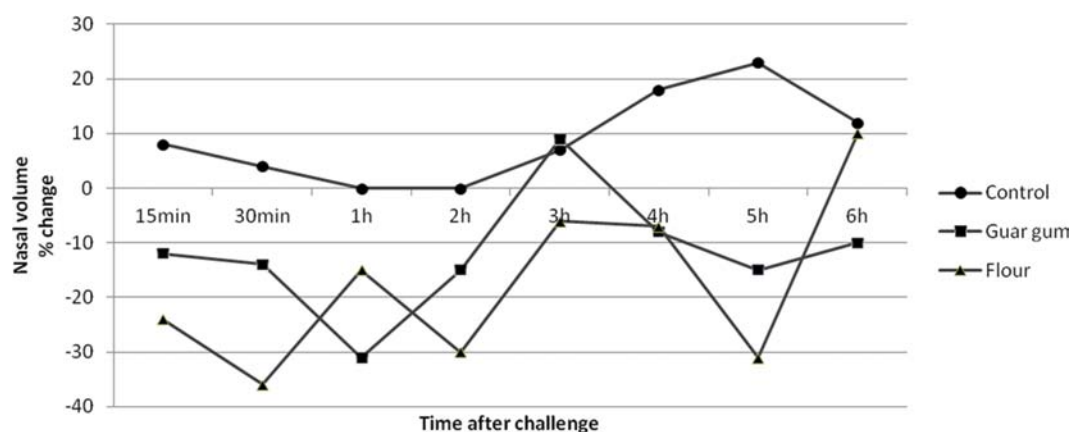


Figure 1. Changes in nasal volume from baseline values during the control day and after challenge with causal agents.

performed to confirm the relationship between rhinitis symptoms and the suspected exposures. Nasal responses to the challenges were additionally monitored with a visual analogue scale and by anterior rhinoscopy. The patient was first challenged with a control agent using a particle generator that delivers low and constant concentrations of the agent [3]; no symptoms or changes in nasal volume were observed. Two days later, the patient was exposed to guar gum, showing an immediate clinical reaction after 1 min of total exposure that was associated with a 31% decrease in nasal volume from baseline values (Figure 1). One week later, he was exposed to flour, showing another immediate clinical response after 15 min of total exposure, with a maximum decrease in nasal volume of 36% at 30 min after the challenge (Figure 1). A diagnosis of allergic OR caused by wheat flour and guar gum was confirmed. The patient was initially advised to avoid further exposure to both agents, which improved his nasal symptoms. Then he was completely removed from exposure as he changed his job because he was later diagnosed with OA.

Discussion

Exposure to wheat flour and guar gum is a well-known cause of OR, but to date, there have been no reported cases of allergic OR caused concurrently by two different occupational allergens and diagnosed following current international recommendations.

The molecular mechanisms underlying the observed dual sensitizing effect may be related to cross-reactivity or co-sensitization. Although related, both terms describe different immunological phenomena and clinical effects. Cross-reactivity occurs when IgE antibodies produced against a particular allergen recognize another antigen carrying the same or very similar epitopes [4]. Clinically, this manifests as symptoms without prior exposure or after exposure to allergenic sources that are unlikely to induce sensitization. In the allergy field, the pollen-food syndrome is a widely recognized example of cross-reactivity [4]. Also, patients with wheat allergy often show cross-reactivity to a variety of cereal grasses such as

rye, barley, oats, maize and sorghum because they share homologous proteins [5]. Epidemiological studies have also shown evidence of potential allergen cross-reactivity in apprentice pastry-makers as well as in apprentices exposed to laboratory animals [6,7].

Co-sensitization refers to the presence of IgE antibodies toward epitopes that are not shared between two allergens [4]. For example, wheat belongs to the family Graminae, whereas guar gum belongs to the family Leguminosae; both are plants, but botanically they are not related. Clinically, patients develop sensitivity to both allergens independently, but often at the same exposure source. Thus, it is plausible that co-sensitization rather than cross-reactivity was the most likely immunological mechanism involved in the present case. The distinction between these two phenomena can be verified through *in vitro* inhibition experiments in which blocking of IgE binding activity occurs if the allergens are cross-reactive [8].

It is important that occupational health professionals suspect and recognize potential cases of concurrent sensitization to related and unrelated allergens when a patient complains of work-related rhinitis symptoms. Furthermore, preventive exposure measures should always take into account the potential for allergy cross-reactivity and co-sensitization secondary to workplace allergen exposures.

Key points

- In the same patient, it is possible to objectively confirm a diagnosis of occupational rhinitis caused by two different allergens present in the workplace.
- Occupational health professionals should consider potential co-sensitization when a patient complains of work-related rhinitis symptoms.
- Preventive exposure measures should take into account the potential for allergy cross-reactivity and co-sensitization secondary to workplace allergen exposures.

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Conflicts of interest

None declared.

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