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Case Report

Allergy after a sandwich: case report of beer allergy in an adolescent

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ABSTRACT

Beer is an uncommon cause of IgE-mediated food allergy despite its widespread consumption. We report an adolescent who developed generalised urticaria and lip angioedema immediately after eating a traditional Portuguese sandwich with a beer-based sauce. He had previously experienced two episodes of delayed generalised urticaria after ingesting small amounts of beer. Serum specific IgE was positive for barley (7.12 kU/l) and barley malt (21.7 kU/l). Prick-to-prick testing was positive for four commercially available beers containing barley malt. He tolerated other barley-containing foods, suggesting that malting and brewing may modify barley proteins and/or generate clinically relevant allergens. The patient was counselled to avoid beer, whisky and foods prepared with barley-malt alcoholic beverages, and was prescribed an adrenaline auto-injector due to the potential risk of anaphylaxis. This case underscores that beer allergy, although rare in paediatrics, should be considered in adolescents presenting with acute urticaria or angioedema after beer consumption or exposure through cooking.

Keywords: Beer, Barley malt, Food allergy, Adolescent

INTRODUCTION

IgE-mediated reactions to beer are uncommon despite the beverage's widespread global consumption.[1,2] Reported presentations range from urticaria to life-threatening anaphylaxis, and most published cases involve adults.[1,3-5]

Beer is traditionally brewed from barley, which undergoes malting, a process in which the grain is partially germinated in water and then roasted at varying temperatures and durations to produce different malt colours. After this, the malt is boiled to create a sugar-rich wort that is fermented by yeasts, most commonly *Saccharomyces cerevisiae* and *S. carlsbergensis*. Hops (*Humulus lupulus*) are added for bitterness and flavour. While barley malt is the primary ingredient, beer may also contain other malted grains such as wheat and rye, as well as unmalted cereals like rice and corn.[1,6] This complex production process introduces multiple potential allergens that may vary by region and recipe.[2] Several barley-derived proteins have been implicated as clinically relevant beer allergens, including lipid transfer proteins and protein Z/serpin proteins.[1,7] Processing during malting and brewing may alter protein structure and influence allergenicity.[8] In addition, not all beers are equally tolerated among sensitised individuals.[9]

CASE REPORT

A 17-year-old male was referred to the Paediatric Allergy consultation of a tertiary hospital for evaluation of a suspected food allergy. Within minutes of eating a francesinha (a traditional Portuguese sandwich served with a beer-based sauce), he developed generalised urticaria and lip angioedema.

Symptoms resolved after an oral antihistamine. He denied respiratory, gastrointestinal, cardiovascular or neurological symptoms. There were no apparent cofactors at the time such as recent physical exercise, alcohol intake beyond the sauce, intercurrent infection, or use of non-steroidal anti-inflammatory drugs.

On further history, he recalled two previous episodes of generalised urticaria occurring approximately 90 minutes after ingesting small amounts of beer (Argus and Heineken) at 14 years of age.

He subsequently ate the same dish on several occasions without reaction, noting that the sauce appeared more thoroughly cooked and lacked a discernible beer flavour.

His past medical history was notable for seasonal allergic rhinoconjunctivitis. Family history included paternal anaphylaxis to shrimp.

Physical examination was unremarkable.

Serum specific IgE was positive for barley (7.12 kU/l; class 3) and barley malt (21.7 kU/l; class 4). Prick-to-prick testing with undiluted samples of four commercially available beers (all containing barley malt, hops and yeasts) produced positive wheals with all tested beers (Table 1). Skin prick testing with commercial aeroallergen extracts was positive for cultivated and wild grasses, *Phleum pratense, Artemisia vulgaris, Betula alba, Platanus acerifolia* and *Olea europaea*.

Table 1: Prick-to-prick skin test results with different beers.

S. no.	Beer brand	Wheal size (mm)*
1	Heineken	12×7
2	Sagres	5×5
3	Super Bock	10×5
4	Argus	6×9

*Histamine control: 6×5 mm; composition of beers tested: 1: malted barley, hops, yeasts; 2: malted barley, hops, yeasts, unmalted cereals (corn, rice, barley); 3: malted barley, hops, yeasts, unmalted cereals (corn, barley); and 4: malted barley, hops, yeasts, unmalted cereals (corn, barley)

The patient was advised to avoid beer, whisky and foods prepared with barley-malt alcoholic beverages. He continued to tolerate other barley-containing foods. The potential risk of future anaphylaxis was discussed, and an adrenaline auto-injector was prescribed. No further reactions were reported at follow-up.

DISCUSSION

This adolescent had reproducible immediate-type reactions associated with beer exposure and objective evidence of sensitisation to barley and barley malt, with positive prick-to-prick tests to multiple beers. Together, these findings support the diagnosis of IgE-mediated beer allergy.

Barley is the predominant substrate used in brewing, and several barley-derived proteins have been identified as beer allergens, including lipid transfer proteins (Hor v 14 and Hor v 7k) and protein Z/serpin proteins.[1,7] These proteins may remain stable through malting and brewing and can therefore persist in the final beverage.[1,7]

A notable feature in this case was tolerance to other barley-containing foods, despite sensitisation to barley and barley malt. This observation is consistent with the hypothesis that malting and brewing can modify barley proteins and/or generate relevant epitopes that are not present, or are less bioavailable, in other barley preparations.[3,8] Differences in beer composition and brewing practices may also contribute to variable clinical reactivity.[9]

All beers tested contained hops and yeasts. Although testing for hops-specific IgE was not available and yeast allergy is considered less likely, their contribution cannot be completely excluded. Alcohol can also act as a cofactor and may lower the threshold for allergic reactions. The patient's history of reacting to a beer-based sauce when less thoroughly cooked, but tolerating the same dish when more thoroughly cooked, suggests that residual allergen concentration and/or heat-related protein changes may influence reaction risk.

Oral challenge was not performed due to the risk of severe reactions. Component-resolved diagnostics for specific beer allergens were also unavailable, which limited identification of the culprit protein.

CONCLUSION

Beer allergy is rare but may occur in adolescents and should be considered when urticaria or angioedema follows beer ingestion or exposure through cooking. Demonstration of IgE sensitisation to barley/malt and prick-to-prick testing with the implicated beverage can support the diagnosis. Strict avoidance of barley-malt alcoholic beverages and an emergency management plan, including an adrenaline auto-injector when appropriate, are key to risk reduction.

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