

## Case Report



# Goat's milk anaphylaxis in a cow's milk tolerant child

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### Conflict of Interest

The authors have no financial conflicts of interest.

### Author Contributions

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## ABSTRACT

Goat's milk (GM) allergy commonly occurs together with cow's milk (CM) allergy due to cross-reactivity between highly homologous proteins. We present an unusual case of GM anaphylaxis in a CM tolerant child.

**Keywords:** Anaphylaxis; Food hypersensitivity; Milk hypersensitivity; Child

## INTRODUCTION

Cow's milk (CM) allergy is among the most common childhood food allergy in developing and developed countries [1, 2]. Goat's milk (GM) allergy commonly occurs in patients with CM allergy due to clinical cross-reactivity from highly homologous GM and CM proteins [3]. It is unusual to have patients with isolated GM allergy without CM allergy. The literature on GM allergy in CM tolerant patients is limited to case reports [4, 5] and case series [6, 7] originating from Europe. We present a unique case of an Asian child who is tolerant of CM but experienced GM anaphylaxis. The patient's parent gave written informed consent for publication of data.

## CASE REPORT

Patient H is a 7-year-old Chinese boy with a background of eczema, allergic rhinitis, and shellfish allergy. He is clinically tolerant of CM and consumes it daily.

He first encountered GM at 6 years of age. The patient developed anaphylaxis 30 minutes after ingestion of GM powder sweets. He experienced urticaria, cough, and wheeze requiring treatment of oral antihistamines and nebulized bronchodilators by his family physician. He was not referred to an allergist.

At 7 years of age, he drank 70 mL of GM formula. Within 15 minutes, he developed anaphylaxis, with angioedema, voice hoarseness, breathlessness, vomiting, abdominal pain, and drowsiness. He visited the Emergency Department and was treated with one dose of intramuscular adrenaline. Serum tryptase was elevated at 14.6 µg/L, 2 hours postreaction, compared to a baseline tryptase of 2.4 µg/L.

Skin prick test showed histamine 6 mm, diluent 0 mm, prick-to-prick GM formula 7.5 mm, fresh GM 12 mm. Specific IgE to CM 0.83 kU/L, GM 54.8 kU/L, and nBos d8 casein 1.51 kU/L.

He holds an adrenaline auto-injector and has been advised dietary avoidance of GM and sheep milk (SM).

## DISCUSSION

This is the first case report from Asia of GM anaphylaxis without CM allergy. CM, GM, and SM are greatly similar. In animal taxonomy, the Bovidae family of cloven-hoofed, ruminant mammals consists of subfamily bovinæ (cow) and caprinae (goat and sheep). Bovidae milk consists of casein and whey, and casein itself comprises of  $\alpha_1S_1$ ,  $\alpha_2S_2$ ,  $\beta$ ,  $\kappa$ , and  $\gamma$  casein. Despite 85%–90% amino acid sequence homology between GM and CM caseins, some patients selectively react to GM without CM allergy [6].

In 1999, Umpiérrez et al. [4] first described a patient with allergy to goat and sheep cheese despite tolerance to CM. Goat casein was determined to be the main allergen via IgE enzyme linked immunosorbent assay and immunoblotting. In 2006, Ah-Leung et al. [6] described a case series of 28 children from France experiencing GM allergy without CM allergy.

There were multiple similarities between our patient and cases described in literature. Firstly, patients were older children, with a mean age of 6 years described in the French case series and the inclusion of 2 adults among the 5 patients described by Viñas et al. [7]. Secondly, the number of recurrent reactions prior to diagnosis. Similar to our patient, 71% of the French cohort experienced 2 or more reactions before diagnosis. Thirdly, the severity of reaction. Our patient experienced anaphylaxis, as with 57% of the French cohort. In the French case series, the authors highlighted that GM was a hidden allergen in pasta, moussaka, pizzas, candies, and sandwiches.

Using enzyme allergosorbent tests (EAST) and EAST inhibition studies with the sera of allergic children, researchers confirmed Umpiérrez's finding that casein was the main allergen and further isolated the allergenic proteins to  $\alpha_1S_1$ ,  $\alpha_2S_2$ ,  $\beta$  casein. In Spain, Rodríguez et al. [8] highlighted the persistence of GM and SM allergy in 25.9% of patients who successfully completed CM-oral immunotherapy.

GM and SM milk consist of only 3.5% of the world's milk [9]. It can be found in various forms including fresh pasteurized milk, milk powder formulated for infants and children, sweets, cheese, and yoghurt. In Asia, while China and India are major GM producers, GM farms and dairies are scattered in multiple countries including Singapore, Malaysia, Thailand, and Korea [10]. With global trade, GM products originating from Europe, New Zealand, and Australia are being exported to Asia. Our case report highlights a unique cause of food anaphylaxis that is relevant in Asia.

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