

Food anaphylaxis to bovine serum albumin

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The role of bovine serum albumin (BSA) in allergy to cow's milk proteins is well known,¹ but little information has been published regarding allergic reactions to beef proteins, especially life-threatening reactions.² We report the case of a young woman with food allergy characterized by severe anaphylactic reactions to raw bovine serum albumin. To our knowledge, no identical case has as yet been reported.

CASE REPORT

A 19-year-old female had experienced three episodes of idiopathic anaphylactic shock during the

Abbreviations used

BSA:	Bovine serum albumin
DBPCFC:	Double-blind, placebo-controlled food challenge
SPT:	Skin prick test

previous 3 years. These reactions had evolved in a stereotypic manner. They began with angioedema, conjunctivitis, and dyspnea, which were followed by malaise and sometimes progressed to unconsciousness. The onset of each of these episodes was about 15 minutes after a meal. The patient could not give precise historical information concerning the content of meals preceding episodes of anaphylaxis. The patient had a history of chronic abdominal pain, with episodes of diarrhea. She also has perennial rhinitis and asthma and respiratory allergic reactions to cats and dogs.

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Table I. Diameter (mm) of SPT responses with raw and cooked meats and albumins (1 mg/ml)*

Meats and albumins	Raw	Cooked
Beef	3	0
Veal	2	0
BSA	5	2.5
Milk	2	ND
α-lactalbumin	0	
Pork	3	0
Albumin	2.5	
Mutton	3.5	1
Albumin	0	
Chicken	1.5	0
Egg		ND
Yolk	1.5	
White	1.5	
Ovalbumin	0.5	
Horse	4	0
Turkey	0	0
Albumin	2	
Duck	0	0
Rabbit	2.5	0
Albumin	5	

ND, Not done.

*Positive control (9% codeine phosphate): 2 mm; negative control (saline diluent): 0 mm.

METHODS

Skin prick tests (SPTs) with 15 standard inhalant allergens (Allerbio) and 32 common food allergens (Stallergènes) were carried out. SPTs were done with the following raw and cooked meats: beef, veal, pork, mutton, chicken, turkey, duck, rabbit, horse, and several fish species. SPTs were also done with BSA, α-lactalbumin, casein, β-lactoglobulin, and γ-globulins.

Assays for specific IgE antibodies in the patient's serum were done with the Phadebas CAP RAST System (Pharmacia), and an in vitro leukocyte histamine release test with BSA in concentrations from 10^{-5} to 10^{-2} mg/ml was carried out according to our previously published method.³

The patient underwent a labial challenge test and double-blind, placebo-controlled food challenge (DBPCFC) with raw BSA and BSA that had been cooked at 100°C for 10 minutes. On the basis of the fact that cow's milk contains 55 mg BSA/10 ml, a mixture of milk and mashed potatoes, containing increasing doses of BSA (55 mg, 137.5 mg, 550 mg, and 1100 mg), was ingested by the patient within 20 minutes.

RESULTS

Investigation of the patient's food intake over a 1-week period revealed that she consumed a large amount of milk products (more than a liter of milk per day, plus 6 to 8 cups of yogurt per day) and beef. SPT responses were positive to cat, dog, cockroach, and birch pollen extracts. SPT responses were positive to raw beef, veal, pork, mutton, horse, and rabbit meat, but negative to these meats when they had been cooked (Table I). SPT responses to BSA were strongly positive, whereas the test responses to other cow's milk proteins and fish, the major allergen of which is parvalbumin, were negative.

The level of total IgE was 1977 kU/L. IgE antibodies specific for BSA and beef were present at 16.6 kU/L and 16 kU/L, respectively. IgE specific for cat and dog epithelia were present at levels greater than 100 kU/L. The leukocyte histamine release test was uninterpretable due to the spontaneous release of 730 nmol/L histamine. The total blood histamine was significantly elevated at 1450 nmol/L.

The labial challenge test result with BSA was negative. The DBPCFC result was positive at 55 mg of uncooked BSA. Symptoms were conjunctival hyperemia, tearing, rhinorrhea, nasal itching, and sibilant rales. In contrast, the DBPCFC result was negative with cooked BSA to doses up to 1842.5 mg.

After these tests, the patient was allowed to eat well-cooked (1 hour of cooking) meats and to drink milk that had been boiled. When she was seen two months later, she had not had another anaphylactic reaction, and her respiratory symptoms had improved. No changes in her exposure to cats and dogs were noted. It is interesting to note that the elimination diet was followed by resolution of diarrhea and abdominal pain.

DISCUSSION

The positive response of our patient to raw BSA in the DBPCFC confirms the existence of a food allergy. The episodes of anaphylaxis were probably related to ingestion of an excess of animal albumins. In addition to the risk of anaphylaxis, this case also documents the risk for asthma induced by albumins consumed in the form of either milk or meat. The fact that the elimination diet was followed by resolution of chronic digestive symptoms is evidence of the role of BSA in these disorders. The thermolability of BSA probably explains the irregular character and variable severity of her clinical manifestations. In a recent study, Werfel et al.² found beef allergy in 11 of 335 children referred for evaluation of atopic dermatitis. Eight of those subjects were also sensitive to milk. Their study demonstrated that specific IgE antibodies to heat-labile beef proteins (especially BSA) might explain why some patients can tolerate well-cooked beef but not medium-rare and rare beef.

Our patient also has a respiratory allergy to cat epithelia. The possibility of cross-reactivity between meat and cat epithelial allergens has been emphasized by Drouet et al.,⁴ who implicate albumin in these reactions. Spitzauer et al.⁵ reported that the cross-reactivity between albumins was of variable intensity according to the species.

This case documents the reality of the risk for anaphylaxis caused by animal albumins and emphasizes that an allergy to these proteins should be sought in patients who are first seen with a history of recurring anaphylaxis of undetermined etiology. The thermolability of BSA was, in our patient, the favorable element that permitted the reintroduction of meats and milk in a well-cooked form, thus allowing her to maintain a good nutritional equilibrium.

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