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Letter to the Editor

Anaphylaxis caused by casein used in artificially marbled beef: A case report

Dear Editor,

Naturally marbled beef is popular in Japan because its tenderness and juiciness practically allow the flavor to flow into the mouth.¹ The marbled texture is a characteristic of “Wagyu” beef from a Japanese cattle breed acclaimed for its tender meat and derived from native Asian cattle. Therefore, Wagyu is usually very expensive in Japan. In some restaurants, meat injected with beef fat (“artificially marbled beef”) may be served as a low priced substitute for genuine marbled beef. Artificially marbled beef sometimes contains sodium caseinate (casein) as a food additive. We report on a patient with cow’s milk allergy who showed an anaphylactic reaction following the ingestion of casein-containing artificially marbled beef.

A 2-year-old boy with a history of adverse reactions to cow’s milk, hen’s egg and wheat was served a beef dish intended to be free of these ingredients that his family had pre-ordered at a hotel restaurant. Within minutes of taking one bite of beef, periorbital edema and wheezing appeared, then the child lost consciousness. He was taken to the emergency room where he was treated with intramuscular adrenaline, intravenous antihistamine and corticosteroids. His symptoms resolved within 2 h and he was discharged with warnings about the possibility of delayed reactions.

Two weeks later, his parents consulted our hospital searching for the cause of their son’s anaphylactic reaction. We asked them for comprehensive details of his food intake: he had not eaten anything other than a beef steak among several meals and had never experienced any allergic reactions to beef itself. Therefore, we surmised that the beef may have been processed. We contacted the hotel restaurant and found that they had used artificially marbled beef which contained casein as one of the food additives. We obtained samples of the same beef as consumed by the patient from the hotel restaurant and performed prick-to-prick tests. We used histamine and saline as positive and negative controls, respectively and accepted mean wheal diameter > 3 mm as positive. The mean wheal diameters were as follows: histamine(7.5 mm), heated sample(15 mm), unheated sample(11.5 mm) and saline(0 mm). His serum was analyzed using the CAP system (Pharmacia, Uppsala, Sweden) for total IgE (133 IU/ml) and for specific IgE to cow’s milk (41.9 UA/ml) and casein (47.6 UA/ml). We analyzed the milk protein content in the artificially marbled beef using an enzyme-linked immunosorbent assay (FASTKIT™; Nipponham, Tokyo, Japan). The content of 1.193 mg/ml was sufficient to cause generalized reactions in cow’s milk-allergic patients. From these results, we

concluded that artificially marbled beef was the cause of the anaphylactic reaction of our patient.

The beef, eaten by the patient, had been prepared by artificially injecting beef fat into red meat to tenderize it. This meat is called artificially marbled beef. It contained sodium caseinate, as a food additive, to improve the texture of the processed meat.

Similar cases of anaphylactic reaction induced by the intake of casein-containing processed meat have been previously reported.^{2,3} Most of these cases were caused by labeling errors (false labeling or omission of labeling) by the manufacturers of processed products such as hot dogs or Bologna sausages. We could find no other report of allergic symptoms induced by the intake of this artificially marbled beef, which is hard to distinguish from genuine marbled beef.

In Japan, Wagyu beef, with its fatty marbled texture and reputation for tenderness, is preferred to tough red meat from Australia or New Zealand. According to the Japan’s agricultural ministry, artificially marbled beef was developed in the 1980s, as a means to make Holstein beef tasty after a dairy cow stops producing milk. So that beef fat could be injected into tough red meat automatically, an industrial processing technique was developed based on the technique called “piquer” in French cuisine. No official statistics for production of artificially marbled beef is available. Currently, artificially marbled beef is served in many restaurants and is sometimes advertised as genuine marbled beef (“Mislabeling scandal doesn’t take away tastiness of processed beef.” The Asahi Shimbun. December 26, 2013). Some Japanese manufacturer built a factory in Australia and has exported the products into Asian countries (<http://www.meltiquebeef.com.au/>). Artificially marbled beef is processed meat so labeling is mandatory.⁴ Therefore, many manufacturers indicate this clearly according to food labeling legislation.

In this case, the restaurant staff lacked relevant knowledge about artificially marbled beef and did not recognize the possibility of contamination with milk protein. In Japan, labeling is not mandatory when food is served at a restaurant, so consumers do not know whether the meat is processed or not unless they ask the restaurant staff.⁵ Even if the manufacturers of artificially marbled beef label the product appropriately, an allergic reaction to milk is still possible if the restaurant staff do not recognize that casein is a milk protein. To make matters worse, if physicians do not know about artificially marbled beef, they may either diagnose that the “beef” caused an allergic reaction when they encounter a case such as ours or not consider artificially marbled beef to be the culprit.

The European Union has allowed the import of Japan’s famed Wagyu beef, including the hugely popular Kobe beef since February 2013 (Official Journal of the European Union 2013;56:13). If Wagyu becomes more popular worldwide, the demand for artificially

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marbled beef, which exhibits a similar texture to Wagyu beef at a lower price, may also increase. Manufacturers must label the food additives used in artificially marbled beef more clearly. Restaurant staff must also be instructed that casein is milk protein and refrain from serving artificially marbled beef to consumers with cow's milk allergy in case it contains casein. Consumers with cow's milk allergy must be instructed that cheap marbled beef may contain milk protein. Otherwise, the number of incidents such as the present case may increase in the future.

Physicians must be aware of the possibility that artificially marbled beef contains casein when a cow's milk-allergic patient presents an allergic reaction after eating beef.

Conflict of interest

The authors have no conflict of interest to declare.

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