

Allergic reaction caused by acesulfame potassium in foods

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The increasing frequency of obesity and related diseases such as diabetes and hypertension is an important healthcare issue. The use of artificial sweeteners has increased in recent decades, for the purpose of limiting excessive calorie intake (1). A large variety of non-nutritive sweeteners are available. Acesulfame potassium is one of these artificial sweeteners, and is used in many types of food and drink. Allergic reactions to artificial sweeteners are very rare. Only a limited number of cases of urticaria and anaphylaxis induced by aspartame (2, 3) and erythritol (4, 5) have been reported previously. We report a patient with allergic reactions caused by acesulfame potassium.

Case Report

A 32-year-old woman suffered from hives and throat discomfort ~10 min after drinking a bottle of an energy

drink. She reported a history of similar symptoms after consuming low-calorie white coffee, low-calorie yogurt drink, and jelly sweets. These foods had three common components: erythritol, sucralose, and acesulfame potassium. The bottle of energy drink was 100 ml in volume, and contained 500 mg of erythritol, 20 mg of sucralose, and 30 mg of acesulfame potassium. Prick tests were performed with commercially available components after informed consent had been obtained from the patient. The prick tests for these three components (at the same concentrations as in the energy drink) gave negative results. We subsequently performed diagnostic challenges with each of these three components. The ingestion of 500 mg of erythritol (Saraya, Osaka, Japan) and 20 mg of sucralose (Wako Pure Chemical Industries, Osaka, Japan) each produced no reaction. We orally challenged the patient with acesulfame potassium (Wako Pure Chemical Industries); the initial dose was 0.03 mg, and the dose was then increased at 30-min intervals. A wheal and erythema developed 20 min after the ingestion of 30 mg of acesulfame potassium, equivalent to the dose in a bottle of the energy drink. The patient also complained of throat discomfort. The cutaneous lesions resolved within 1 hr, without antihistamines. We attributed the patient's allergic reaction to acesulfame potassium.

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Discussion

Acesulfame potassium was discovered in 1967 by the pharmaceutical company Hoechst (1). This high-intensity sweetener is ~200 times sweeter than sucrose. It is usually combined with aspartame or sucralose to provide a synergistic sweetening effect. The Food and Drug Administration approved its use in dry foods in 1988 and as a general sweetener in 2003 (6). It is used in >100 countries in >5000 products (1). In the present case, prick testing with acesulfame potassium gave a negative result; however, the patient developed a hypersensitivity reaction during the oral challenge test with acesulfame potassium at a dose of 30 mg. These findings indicate that the amount of ingested acesulfame potassium is critical for eliciting hypersensitivity.

Very recently, Stohs and Miller reported a case of allergic reaction to acesulfame potassium (7). When the patient consumed a sports performance drink containing 135 mg of acesulfame potassium, lip and facial swelling, sinus congestion and difficulty in breathing appeared. The other rehydration and energy fluid, containing 29 mg of acesulfame potassium, produced a milder allergic reaction. This dose is almost equal to the dose used in

the oral challenge test that induced a slight erythematous reaction in our patient. These findings suggest that allergic reaction to acesulfame potassium is dose-dependent. This patient had a history of hypersensitivity reactions to a variety of sulfur-containing ingredients, including sulfite, taurine, and sulfonamides. A sulfite (SO_3) moiety is commonly contained in these compounds. Our patient had no history of allergic reactions to other sulfur-containing foods. She was not patch tested to metabisulfites.

Although some cases of allergic reactions to sweeteners have been reported (2–5, 7), the mechanism remains unclear. Shirao et al. reported an 11-year-old boy who experienced anaphylaxis upon ingesting an erythritol-containing food (4). They found that the basophil activation test (BAT) gave a clearly positive result for erythritol, and suggested that his allergic reaction to erythritol was IgE-mediated. Laboratory tests such as the BAT were not performed in this case, but would be useful to determine whether this was an IgE-mediated allergic reaction. Artificial sweeteners may be considered in the differential diagnosis of allergic reactions to foods.

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