

Correspondence

Anaphylaxis to vitamin B2 added to an energy drink

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Energy drinks are soft drinks developed for consumption during periods of increased mental and physical exertion, and can be drunk in virtually any situation. In general, they include a combination of caffeine, B vitamins, taurine and herbal ingredients. They are consumed all over the world, but to our knowledge, anaphylaxis to such drinks has not been published or reported in the literature. We report a case of anaphylaxis induced by an energy drink.

A 23-year-old Japanese woman, with a personal history of rhinitis and allergy to buckwheat, developed urticaria and anaphylaxis after drinking 100 mL of an energy drink (Richmin3000; Towaseiyaku, Wakayama, Japan). The patient was taken to hospital and treated with an injection of epinephrine, after which she improved rapidly.

The patient's total IgE value was 86 IU/mL (normal < 380). Results of a prick test and intradermal test with the drink were negative. Oral provocation tests with the drink were then performed. No reaction occurred after ingestion of 10 mL of the drink, but anaphylaxis occurred after ingestion of 100 mL (Fig. 1).



Figure 1 Wheal and erythema induced by the ingestion of 100 mL of Richmin energy drink.

The ingredients and additives in the drink include thiamine 10 mg, riboflavin sodium phosphate 10 mg, pyridoxine hydrochloride 10 mg, nicotinamide 30 mg, caffeine 50 mg, taurine 3000 mg, glucose 20 g, polyvinylpyrrolidone 100 mg, citric acid 400 mg, malic acid 200 mg and sodium benzoate 60 mg. Four weeks after the previous tests, another skin test was conducted for each ingredient. Results of a prick test were negative but an intracutaneous test was positive to riboflavin sodium phosphate 0.1% (weal diameter 6 mm, erythema diameter 30 mm). The same cutaneous test was performed on a control group of five adults, with negative results. No positive reactions developed in the patient after application of any of the other ingredients by prick and intracutaneous tests. A histamine release test (Shionogi, Osaka, Japan) using the patient's basophils showed a positive response with riboflavin sodium phosphate, whereas basophils from healthy controls showed a negative response.

Three weeks later, skin testing of the other types of vitamin B2 medicines [riboflavin, flavin adenine dinucleotide sodium (FAD) and riboflavin tetrabutyrates] was conducted on our patient. Again, the results of the prick test were negative but the intracutaneous test was positive for riboflavin tetrabutyrates 0.1% (weal diameter 7 mm, erythema diameter 27 mm). The patient had never experienced any allergic reaction to riboflavin-rich foods, such as milk, meat, eggs or cereal products.

Riboflavin is a yellow to orange fluorescent pigment with the chemical structure of a substituted isoalloxazin ring system linked to ribitol.¹ It is the precursor of the coenzymes FAD and flavin mononucleotide, both of which are associated with several respiratory enzymes in plants and animals as electron carriers, and it is important in biochemical oxidation and reduction reactions.² Riboflavin sodium phosphate is the phosphoric acid ester of riboflavin.¹ It is a sodium salt of vitamin B2 but is more quickly dissolved in water and absorbed, and thus offers higher blood concentrations. Because it is difficult to dissolve riboflavin in water, riboflavin sodium phosphate is used for vitamin B2 injection and as an additive in food and beverage.

Clinicians should be aware that riboflavin sodium phosphate in medicine or energy drinks might cause anaphylaxis.

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