

Anaphylactic reaction to apple juice containing acerola: Cross-reactivity to latex due to prohevein

To the Editor:

Acerola (*Malpighia glabra* L; Barbados cherry) distinguishes itself by its high content of ascorbic acid.¹ To enhance the vitamin C content and improve the flavor of some special products, acerola extract has been added to jams, jellies, and ice cream and especially to fruit juice. In several countries, many "natural food" outlets promote various "vitamin C products" made from acerola, including powders, tablets, capsules, juices, and syrups. We report a case of an anaphylactic reaction after the drinking of apple juice supplemented with acerola in a latex-allergic patient, and we characterize the responsible cross-reactive allergen.

A 37-year-old self-supporting wine trader developed urticaria with skin redness, itching, dyspnea, and tachycardia 5 minutes after drinking a glass of apple juice supplemented with acerola. Anamnestically, the patient reported that apples and apple juice are well tolerated. During the previous 13 years he had shown typical seasonal hay fever symptoms caused by grass pollen and wild herbal pollen. Since his childhood, a significant contact urticaria induced by natural rubber latex products (eg, gymnastic mats and condoms) was well known. In addition, he experienced an oral allergy syndrome after ingesting avocado, celery, walnut, and curry during the pollen season.

Skin prick tests with a wide panel of inhalants and food extracts showed (a) positive reactions (wheal size, same as that for histamine) to grass pollen mixture, rye, and latex, (b) weak reactions to plantain, hazel, and birch pollen, but (c) only a limited reaction to mugwort and ragweed pollen as well as to curry. Intracutaneous skin tests with acerola pulp and with acerola-containing apple juice yielded immediate reactions at a dilution of 1/1000 for acerola pulp and at a dilution of 1/100 for apple juice containing acerola.

Results for apple juice without acerola were negative up to a dilution of 1/10.

In vitro tests performed according to the Pharmacia CAP method (Pharmacia-Upjohn, Uppsala, Sweden) showed a total IgE value of 145 kU/L and a latex-specific IgE value of 24.7 kU/L (CAP class 4). Other specific IgE antibodies were found for grass pollen (CAP class 3), plantain, peanut, tomato, soy bean (CAP class 2), hazelnut pollen, ragweed pollen, banana, green apple, herbal mixture, and nut mixture (CAP class 1).

Open oral challenge tests were performed with apple juice and acerola pulp diluted 1/100 and 1/10 in water and with apple juice without acerola supplementation. The reaction was negative for apple juice, but the exposure to acerola pulp, with a latency period of 5 minutes, induced itching and swelling lips. Furthermore, by using an enzyme

allergosorbent test, specific IgE to acerola (1.50 kU/L) could be detected. The electrophoretic profile of acerola extract showed proteins over the entire range of molecular weights, with a dominant protein band in the range of 20 kD. In addition, specific IgE tests performed by use of the CAP system with recombinant latex allergens and native Hev b 6.02 yielded the following results: negative (>0.35 kU/L) for rHev b 1, rHev b 3, rHev b 5, and rHev b 10; positive for rHev b 6.01, rHev b 6.02, Hev b 6.02, and rHev b 8 (Table I).

Table I. Specific IgE testing to recombinant and native latex allergens

Allergen	Specific IgE value[kU/L]
Latex*	24.7
rHev b 1	<0.35
rHev b 3	<0.35
rHev b 5	<0.35
rHev b 6.01	17.1
rHev b 6.02	18.7
Hev b 6.02	17.0
rHev b 8	0.7
rHev b 10	<0.35

The recombinant latex allergens were produced as fusion proteins containing maltose-binding proteins and coupled to CAP by MIAB, Inc (Uppsala, Sweden) (Dr M. Lundberg).

*Commercially available (k82-CAP Pharmacia).

In inhibition studies (Table II), IgE binding to acerola allergens was completely inhibited (100%) by latex and acerola extract, whereas preincubation of the patient's serum with acerola showed nearly complete inhibition to latex (79%) and rHev b 6.01 (85%).

Table II. Inhibition study: ability of acerola extract or latex extract to inhibit the binding of serum IgE antibodies to latex, rHev b 6.01, rHev b 8, or acerola

IgE antibodies (without inhibitor) to:	kU/L	Preincubation with:	kU/L	Inhibition (%)
Latex	3.0*	Acerola†	0.6	79
rHev b 6.01	3.3*	Acerola†	0.5	85
rHev b 8	0.6	Acerola†	0.6	5
Acerola	1.8	Acerola†	<0.35	100
Acerola	1.8	Latex‡	<0.35	100

*Serum dilution (1:5) with PBS.

†10 μ L of an acerola-extract (0.15 mg protein/mL).

‡10 μ L of a latex extract (1 mg protein/mL).

In contrast, rHev b 8 as a solid-phase allergen and acerola as an inhibitor revealed no significant inhibition. Consequently, latex profilin Hev b 8 is not the cause of the cross-reactivity.

Our data clearly demonstrate that the most important allergen for the latex-acerola cross-reactivity was Hev b 6.01. Prohevein (Hev b 6.01) is a chitin-binding protein and one of the most important natural rubber latex allergens. The hevein domain (Hev b 6.02) of this molecule probably plays a major role in the IgE binding activity of prohevein. Class I chitinases with an N-terminal heveinlike domain are likewise present in avocado^{2,3} and chestnut³ and are therefore responsible for the cross-reactivity with latex.

Blanco et al³ postulated that class I chitinases are probably the panallergens responsible for the latex-fruit syndrome. This is further supported by the finding that a 45-kD acidic protein with a heveinlike N-terminal domain in *Ficus benjamina*⁴ is the major cross-reactive counterpart to latex allergens Hev b 6.02 and Hev b 6.01.

To our knowledge, this is the first report demonstrating a cross-reactivity between latex and acerola. In this case, the inducer of the anaphylactic shock was not apple juice itself but rather acerola, which is added only in small concentrations to apple juice.

Allergologists should include acerola on the growing list of latex-cross-reactive food allergens. It will thus be necessary to give latex-allergic patients information about cross-reacting allergens such as the acerola in apple juice.

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Monika Raulf-Heimsoth, PhD ^a

Ralf Stark, MD ^b

Ingrid Sander, PhD ^a

Silke Maryska ^a

Hans-Peter Rihs, PhD ^a

Thomas Brüning, MD ^a

Thomas Voshaar, MD ^b

^aResearch Institute for Occupational Medicine

Berufsgenossenschaften (BGFA) Institute

Ruhr-University Bochum

Bochum, Germany

^bHospital Bethanien

Moers, Germany

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TOP

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