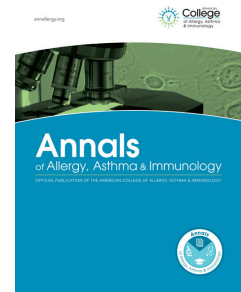


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Anaphylactic shock after first exposure to star fruit in a bird keeper

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LTP (lipid transfer protein), CCD (cross-reactive carbohydrate)

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Averrhoa carambola – also known as star fruit – is a fruit native to the South Pacific and Southeast Asian countries that was introduced in the western countries in the early 1930s, and has now become a worldwide popular fruit that can be eaten raw in juices, pickles and salads. Star fruit (SF) is rich in vitamins and potassium, and is known for its antioxidant and antimicrobial properties¹. Several studies have demonstrated the nephrotoxic and neurotoxic effects of some of its components, especially in those patients who suffer from kidney failure²⁻⁵. There is a case report of oral allergy syndrome to SF in a patient with atopic dermatitis and cutaneous sensitization to SF⁶, but no anaphylactic reactions have been reported yet.

We present the case of a 58-year-old man who, during a walk in the Colombian jungle, presented with intense pruritus of palms and soles, swollen eyelids, severe dyspnea, wheezing and sudden loss of consciousness. He was immediately transferred to a nearby rural health post where he received parenteral treatment – not documented-, achieving complete remission of all symptoms within the next hour. Minutes before the episode, he ate 4 pieces of SF, that being the first - and last - time he tasted that fruit.

Once at home, the patient was referred to our Unit for an allergy workup. He had no allergic background, neither pathological antecedents nor current treatments. He tolerated the usual Mediterranean fruits as well as mango, papaya, kiwi and pineapple, various types of peas, corn, wheat, barley, and millet and flax seeds and had never experienced any other food reaction. He had tolerated hymenoptera stings –both honeybee and wasp stings- and had never suffered any anaphylactic reaction before. He worked as a plumber and as a hobby he took care of racing pigeons, while presenting with ocular pruritus, sneezing and wheezing every time he cleaned their cages and handled the pigeon food. Outside this context, the patient remained asymptomatic.

25 Protein extracts from SF pulp and SF seeds were prepared by homogenization in
26 phosphate buffer saline, dialyzation and lyophilization. Protein extracts from the seeds
27 of the pigeon food components (PFC) were also prepared – corn, wheat and 3
28 unidentified types of seeds -.

29 After written informed consent, cutaneous tests were performed to the following
30 allergenic sources with the results detailed hereinafter: skin prick tests (SPT) at 10
31 mg/mL and prick-by-prick tests with SF extracts -pulp and seeds- and extracts from 2 of
32 the 5 different types of seeds found in the PFC were positive (wheal diameter > 9 mm).
33 SPT to common inhalants, common fruits (pineapple, cherry, plum, coconut,
34 strawberry, fig, kiwi, lemon, tangerine, apple (skin), apple (pulp), peach (skin), peach
35 (pulp), melon, orange, loquat, pear (pulp), banana, watermelon, white grape, black
36 grape and avocado), panallergens (peach lipid transfer protein (LTP) -Pru p3- and
37 profilin from date palm pollen –Pho d2-) and to 3 of the 5 different types of seeds found
38 in the PFC were negative (wheal diameter < 3 mm).

39 Total IgE was 353 kU/l and basal tryptase 4.8 µg/ml. To expand the diagnostics, the
40 ImmunoCAP® ISAC method was used. Among all the allergenic components studied,
41 only cross-reactive carbohydrate (CCDs) were positives (nJug r2, nCyn d1 and nPhl
42 p4). SF was not included in the panel.

43 SDS-PAGE Immunoblotting with SF extracts -pulp and seeds- and extracts from the
44 PFC (corn, wheat, and 3 unidentified types of seeds) were performed. Immunoblotting-
45 inhibition assays with SF pulp extract in solid phase and SF pulp extract and extracts
46 from PFC as inhibitory phase were also carried out (1 mg extract /ml was used in all
47 inhibition assays). To assess the role of the CCDs as a possible cross-reactivity cause,
48 bromelain was used in the inhibitory phase of the assay (200 µg/ml was used). Negative
49 controls for all the assays were carried out.

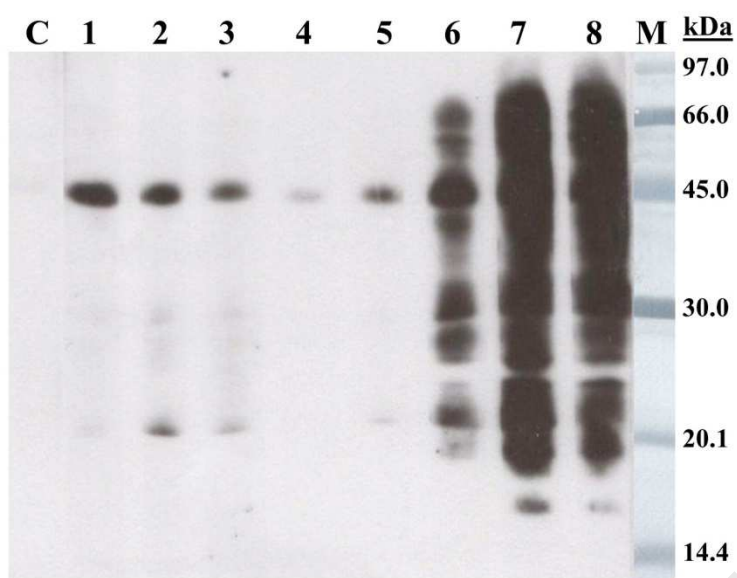
SDS-PAGE Immunoblotting revealed IgE reactive bands in all the studied extracts. IgE-binding bands of 55, 33, 30 and 24 kDa were detected in the SF pulp extract, and bands of 55, 45, 38, 33 and 24 kDa in the SF seed extract (Fig1a). Immunoblot inhibition assay revealed that all the extracts from the PFC were able to produce a clear IgE binding inhibition on the SF pulp extract whereas the 2 unrelated inhibitor phases (ovalbumin and lamb extract) did not produce any kind of inhibition (Fig1b). The partial inhibition observed with SF pulp extract (homologous inhibition) informs us that SF is not the allergenic source of primary sensitization. Bromelain produced only a slight inhibition. These results illustrate the existence of IgE-cross-reactivity and common antigenic structures among SF proteins and some proteins from the PFC. The IgE reactive proteins detected by Numata et al⁶, (52 kDa; 92 kDa) are not likely the same as those detected by us: we detected SF proteins which cross-react with seed proteins, and they probably detected SF primary sensitizing proteins. This is the first documented IgE-mediated anaphylaxis to *Averrhoa carambola*, an exotic fruit that is becoming increasingly popular over the occidental countries. Novel foods should be considered when managing food allergies, even those that might not be intuitively suspected as allergy triggers. Furthermore, the performed Immunoblotting and inhibition assays revealed cross reactivity between the allergenic structures of birdseed and SF, strongly suggesting that the patient sensitization to the birdseed with which he feeds his racing pigeons might have predisposed him to develop allergy to SF and this near-fatal reaction after first exposure.

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a. SDS-PAGE Immunoblotting results. A) Star fruit pulp extract B) Star fruit seed extract C) Seed-1 extract D) Seed-2 extract E) Seed- 3 extract F) Wheat seed extract G) Corn seed extract.

b. SDS-PAGE Immunoblotting-inhibition results. Solid Phase: Star fruit (pulp). Lane C: control serum (pooled of sera from nonatopic subjects). Lane 1: patient serum preincubated with extract from type seed-1 (bird food) Lane 2: patient serum preincubated with extract from type seed-2 (bird food) Lane 3: patient serum preincubated with extract from type seed-3 (bird food) Lane 4: patient serum preincubated with extract from wheat seed Lane 5: patient serum preincubated with extract corn seed Lane 6: patient serum preincubated with bromelain Lane 7: patient serum preincubated with ovalbumin Lane 8: patient serum preincubated with lamb extract. M: molecular mass marker. kDa:kilodalton.

a**b**