

Evidence of mold allergy in patients with allergic reactions to packaged juices.

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To the Editor:

Food-induced anaphylaxis is occurring more frequently in response to composite foods where the culprit may be a contaminant.¹ A few published case reports describe anaphylactic reactions in patients after consuming foods contaminated with mold. One patient died after consuming mold-contaminated pancake mix.² Another experienced a non-life threatening anaphylactic reaction to mold-contaminated bee-pollen.³ A case of true anaphylaxis occurred after a patient consumed dry cured meat products that require mold in their preparation.⁴ Quorn, a meat substitute made with mycoprotein, caused a lethal anaphylactic reaction in a pediatric patient with a previously known mold allergy.⁵ Multiple reports on the internet and news outlets have described parents finding mold in preservative-free juice drinks, but no reports have described allergic reactions.

Case Presentations

We have observed four patients presenting with an allergic reaction to packaged, preservative-free drinks who subsequently had negative skin testing to the individual fruits and dyes contained in these beverages. Two of the four cases had positive skin tests for mold, raising concern that mold contamination might pose life-threatening risks in children with mold allergies.

Case 1

A female with a history of environmental allergies, eczema, and obesity was 11 years old at the time of her reaction. She sought care after an episode of lip swelling, nasal congestion and throat discomfort immediately after ingesting a Capri Sun® Pacific Cooler (pear, grape, and orange juice concentrates, pineapple and apple juice). Symptoms were treated at home with 50 mg of Benadryl, improved immediately, and resolved completely within a week. Her exam was notable only for a blood pressure of 138/62 and mild erythema of her oropharynx and nares. She began a 5-day course of prednisone, was prescribed an epinephrine pen, and was referred for further testing. Two weeks later she received skin testing for apple, pineapple, grape, orange, pear, fresh orange, and Capri Sun®, all of which tested negative. She had large positive skin prick reactions to cat, mixed grass and one mold (*Alternaria alternata*), and tested positive to penicillin. An entire panel of environmental allergens, including dog, dust mite, trees, and weeds, tested negative, and she passed an oral pineapple challenge. It was concluded that the patient had likely reacted to a mold contaminant in the Capri Sun.

Case 2

A female with a past medical history of asthma, eczema, environmental allergies and GERD. She was already being followed closely by pediatric allergy for her chronic atopic diseases. She had previous allergy skin prick testing that was positive to both species of house dust mite, as well as Sugar Maple tree at the age of 9; at age 16, she tested positive to cat and dust mites. At the age of 17, when she presented to allergy clinic for

follow-up, she reported an episode of lip swelling the year prior after drinking a Wild Cherry Capri Sun®. She reported that she had tolerated other flavors and eaten cherries prior to that reaction without difficulty. Her exam was notable only for edematous nasal turbinates, and a slightly erythematous oropharynx. Skin testing for cherry was negative. Skin testing for aeroallergens revealed positive skin prick testing to two mold species (*Alternaria alternata* and *Aspergillus* mix). Intradermal testing was positive to birch tree, dog, mixed trees and ragweed. Other individual pollens, mouse and cockroach tested negative. It was concluded that her reaction may have been attributable to mold contamination in the Capri Sun®.

Case 3

A female with a history of eczema and high cholesterol presented to allergy clinic at age 4. Her mother reported that at age 8 months, she had a reaction to a Kool aid® Jammer (red in color, possibly cherry-flavored). Within minutes she experienced lip and eyelid swelling and urticarial rash on face and trunk. She was seen in our Emergency department, was treated with oral steroids and antihistamines, and the symptoms resolved. Red dye was presumed to be causal, but she continued to consume items containing red dye over the following years without adverse reaction. Her physical exam was unremarkable at the time of her allergy visit. Skin prick testing to red dye, strawberry, cherry, and blueberry was negative. She returned at age 7 for skin prick testing for mold (*Alternaria alternata*, *Bipoaris sorokiniana*, *Hormodendrum cladospor*, *Aspergillus* mix, and *Penicillium* mix); all of these tests were negative.

Case 4

A male with a history of spondylolysis who presented to allergy clinic at age 16 as a referral from his pediatrician for intermittent urticarial rash and an allergic reaction to lemon. The reaction had occurred the year prior and was following consumption of a lemonade Capri Sun®. He experienced itching of the throat and some difficulty swallowing within 20 minutes of drinking the beverage. The symptoms resolved spontaneously within an hour. He had previously tolerated lemon and lemon-flavored drinks, but had been avoiding all forms of lemon since the reaction. His physical exam at that time was unremarkable. Food skin prick testing was performed to lemon and was negative. Unfortunately, this patient could not be reached for further mold testing.

Discussion

Approximately 80,000 fungal species have been identified, and >1 million may exist.⁶ Respiratory and skin symptoms caused by exposure to these environmental allergens are not uncommon in the atopic population,⁴ with rates of sensitization in allergy patients ranging from 5% to 20%.⁶ Case reports suggest that previous sensitization may lead to life-threatening anaphylactic reactions through direct ingestion of molds.^{4,7}

In previous case reports, the most common molds identified as food contaminants were *Penicillium*, *Fusarium*, *Mucor*, *Aspergillus*, *Alternaria*, and *Cladosporium*.^{2-5,8} The molds encountered in food spoilage are strictly aerobes.⁹ Oxygen must enter the packaging during manufacturing or afterwards by compromise of the seal, after which high water and carbohydrate content and low light create an environment ripe for mold growth.⁹

Our two patients with allergic symptoms after drinking juices and positive skin tests for mold were tested for only five of the most common mold types in our area: *Alternaria alternata*, *Bipoaris sorokiniana*, *Hormodendrum cladospor*, *Aspergillus* mix, and *Penicillium* mix. The third patient did not test positive for these molds, but could theoretically be allergic to a different mold species present in her beverage. Although the fourth patient could not be tested for mold, he experienced an allergic reaction following consumption of a packaged juice, and later tested negative to the ingredient which might have explained his reaction. Together, these results are concerning for mold contamination in packaged, preservative-free juices. In response to this risk, Capri Sun? changed their juice packaging in 2014 to include clear bottoms, so consumers can detect the presence of molds.¹⁰

Our four patients did not experience true anaphylaxis, but previously published case reports describe patients with previous sensitization to allergens who have experienced anaphylaxis after ingesting food with hidden

contaminants. Many health implications associated with ingesting mold cause concern for the safety of children who drink packaged, preservative-free juices. Further studies are needed.

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