

## Food allergy to uncommonly challenged foods is rare based on oral food challenge



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### Clinical Implications

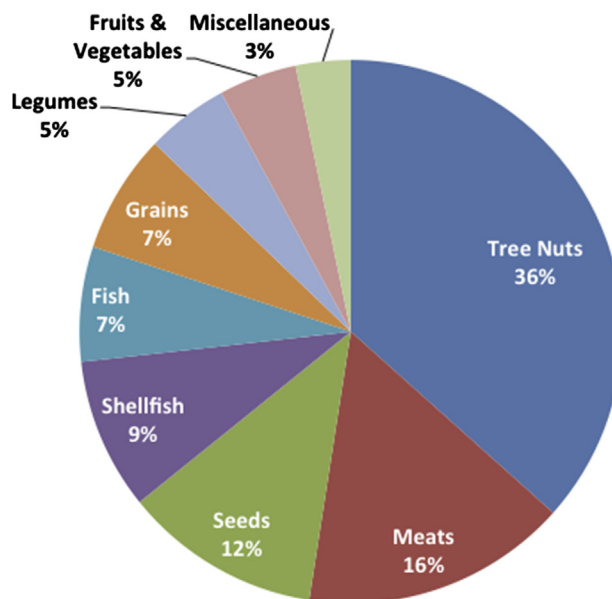
- Prevalence of allergy to uncommonly challenged foods is believed to have risen over the past few decades. But the rate of reactions on oral food challenges to these foods is consistently low. Practitioners should perform oral food challenges to these less commonly challenged foods to prevent misdiagnosis of food allergy if selected appropriately.

### TO THE EDITOR:

The awareness of food allergy (FA) has been steadily rising over the past few decades, with a substantial increase in the prevalence of FA among children.<sup>1,2</sup> Although milk, egg, wheat, peanut, and soy account for most of the oral food challenges (OFCs) reported,<sup>3,4</sup> allergy to other foods continues to rise.<sup>5</sup> As awareness of allergy to these less commonly challenged foods rises, so does the need to perform food challenges to these foods. Increasingly more children are put on strict and unproven food elimination diets that have led to poor weight gain and malnutrition due to these food allergies. To correctly diagnose FA, OFCs are necessary because most *in vitro* assays and skin tests have poor accuracy in uncommon foods, making misdiagnosis common.<sup>1</sup>

Therefore, we retrospectively reviewed all OFCs to any food excluding milk, egg, wheat, peanut, and soy at The Children's Hospital of Philadelphia (CHOP) from August 2004 to October 2012 (for details, see this article's Online Repository at [www.jaci-inpractice.org](http://www.jaci-inpractice.org)). Of the 366 open OFCs, 5 challenges were indeterminate because subjects refused to complete the challenge, leaving 361 interpretable challenges.

The mean age of those challenged was 7 years (range, 1-18 years), and most were male (68.4%) (see [Table E1](#) in this article's Online Repository at [www.jaci-inpractice.org](http://www.jaci-inpractice.org)). Most children had asthma (71.4%) and a history of other FAs (90.9%), whereas almost half had atopic dermatitis (48.2%). Less than half (43.8%) of the cases involved a history of ingestion of the food (see [Table E2](#) in this article's Online Repository at [www.jaci-inpractice.org](http://www.jaci-inpractice.org)), suggesting that more than half were avoiding foods solely on the basis of skin or serum IgE testing due to severe atopic dermatitis or "possible" cross-reacting foods (eg, tree nuts [TNs] with peanuts). The mean wheal size for all patients was 4.4 mm (range, 0-26), and there was only a small statistically significant difference in wheal size for patients who passed the OFC (4.01 mm; range, 0-20) and those who failed (5.84 mm; range, 0-26;  $P < .0005$ ). Serum IgE testing was conducted in 138 (38.2%) challenges because there are no published parameters for many of these foods.



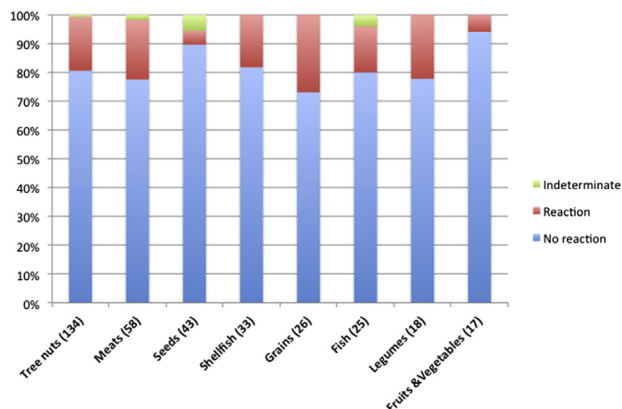
**FIGURE 1.** Pie chart of OFCs. All foods challenged except for milk, egg, peanut, soy, and wheat are expressed as percentage of total foods challenged (366).

The 5 most common food categories to which children were challenged were TNs, meats, seeds, shellfish, and grains ([Figure 1](#); see [Figure E1](#) in this article's Online Repository at [www.jaci-inpractice.org](http://www.jaci-inpractice.org)). Overall, 293 or 81.1% of the children passed OFCs, with similar pass rates within each food category ([Figure 2](#)). Failure rate was associated with a history of other FAs (odds ratio, 8.2;  $P < .04$ ), but there was no correlation to age, sex, other atopic history, or history of reaction. Wheal size was slightly larger in those who failed (5.84 mm vs 4.01 mm; odds ratio, 1.16;  $P < .0004$ ) (see [Tables E1](#) and [E2](#)).

Significant risk factors for failed OFCs were younger age for TN (6.48 vs 7.4;  $P < .03$ ) and meat (4.08 vs 6.02;  $P < .04$ ) and larger wheal size for TN (6.63 vs 3.53;  $P < .0001$ ) and fish (8.75 vs 3.41;  $P < .001$ ) (see [Tables E2](#)).

Sixty-eight patients failed OFCs. Eighteen (26.5%) had only cutaneous reactions, 9 (13.2%) had noncutaneous single organ involvement (respiratory, gastrointestinal, or neurologic), and 41 (60.3%) had reactions involving 2 or more organ systems. For severe reactions requiring epinephrine (6.3% of all challenges, 33% of the failed challenges), most of the subjects were male (87%) and had a history of asthma (87%), eczema (57%), reaction to the food (52%), or other FAs (100%) (see [Table E3](#) in this article's Online Repository at [www.jaci-inpractice.org](http://www.jaci-inpractice.org)). There were no statistically significant risk factors to identify patients who required epinephrine (see [Table E3](#)).

Our data suggest that the occurrence of any reaction or anaphylaxis after OFCs to less commonly challenged foods (18.8%) is much lower than that of reactions observed during OFCs to peanut, egg, milk, and wheat at CHOP<sup>6</sup> (45%). The pass rate for rare foods in our study (81%) was similar to that previously reported by the Sampson group (83.9%)<sup>7</sup> or the 94%



**FIGURE 2.** Pass rates for each food category. The pass rate for food challenges expressed the percentage of each food challenge. The number of food challenges in each category is shown in the (n) next to the food. The pass rate ranged from 73% for grains to 94% for fruits and vegetables. Food challenged by category are TNs (almond, cashew, hazelnut, pecan, pistachio, and walnut); meats (beef, chicken, ham, pork, turkey, and lamb); seeds (sesame seeds, sunflower seeds, and pine nuts); shellfish (crab, lobster, and shrimp); fish (cod, flounder, salmon, tuna, and anchovy); fruits and vegetables (apple, blueberry, celery, coconut, lettuce, green bean, orange, potato, tomato, and strawberry); grains (barley, corn, oat, rice, rye, and quinoa); legumes (black beans, chickpeas, lentils, and peas); and miscellaneous (cinnamon, citric acid, flaxseed, garlic, granola bar, mustard, and sheep milk).

found in the 110 OFCs done by Fleischer et al<sup>8</sup>; however, both Sampson and Fleischer et al found that the rate of reactions to common foods (78% pass Mt Sinai and 81% National Jewish) was not different from that to rare foods. The most likely difference is that we are challenging children with a larger skin test and specific IgE for both common and rare foods (Mt Sinai skin test mean 3-4 mm<sup>7</sup> vs CHOP skin test mean 4-6 mm; skin test data not available for National Jewish). Even with the larger skin test, we are still having a similar lower rate of reactions, indicating that patients with a large skin test to rare foods should be challenged. However, these studies are in contrast to the work from Perry et al,<sup>9</sup> which had 43% of the patients having a reaction but they examined only common food allergens,<sup>9</sup> similar to our previous data<sup>6</sup> of 45% to these allergens. On examining our previously published data<sup>6</sup> with the data presented here, we see that the most common FAs have not changed in the last 3 decades,<sup>3,4</sup> with milk, egg, and peanut being the most common and rare reactions to minor foods.

In our present study, only a slight difference in wheal size, history of other FAs, and younger age (for TN and meats) was associated with OFC failure. Of all failed reactions, there were no clear risk factors to predict severe reactions (see Table E3).

Twenty-three (43%) cases requiring epinephrine were for TN OFC, suggesting that in those with true allergy to TN, reactions may be more severe. We have a higher rate of use of epinephrine in failed challenges than in previous studies<sup>3,4,7-9</sup> because we use epinephrine in any reaction involving 2 or more systems, even mild reaction with vomiting and hives.

We conclude that OFCs to these less commonly challenged foods should be performed if selected appropriately because the vast majority of these challenges will be negative. The rate of reaction in OFCs is lower to uncommon foods than to common foods. Finally, most reactions will be mild, and the most common FAs have not changed in the last 3 decades.

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