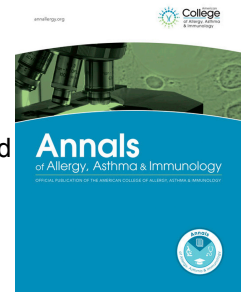


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Review of Ordering Practices for Single Allergen and Serum IgE Panel Tests for Food Allergy

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1 The incidence of Immunoglobulin E (IgE)-mediated food allergy (FA) is increasing and
2 currently affects as many as 8% of children in the United States.¹ Appropriate diagnosis requires
3 a clinical history consistent with an immune-mediated reaction after ingestion of a food and can
4 be supported by skin prick tests and/or serum specific IgE (sIgE) levels. In cases of
5 indeterminate history or testing, supervised consumption of the implicated food through oral
6 food challenge (OFC) is the diagnostic gold standard.²

7 Commercially available sIgE testing can be ordered by both allergy and non-allergy
8 providers. Obtaining sIgE as a screening test is not recommended due to its low positive
9 predictive value.² However, the availability of “allergy panels” that combine multiple food sIgE
10 tests under a pre-selected order set has made it simple for providers to order several sIgE at once,
11 often including foods that were not suggested by clinical history. When results are reported as
12 abnormal, they can lead to diagnostic confusion, unnecessary dietary elimination and increased
13 healthcare costs.³

14 We previously reviewed the sIgE ordering practices from our institution’s clinical
15 laboratory and demonstrated that primary care providers order significantly more panels with
16 multiple food allergens compared to allergists, who tend to order single-food sIgE tests.⁴ In that
17 study of 2013 laboratory data, 3065 allergen panels were ordered, 78.8% of which were obtained
18 by non-allergists.⁴

19 We performed a follow up retrospective review of food allergen specific IgE laboratory
20 tests completed at a reference center laboratory associated with a tertiary care children’s hospital
21 from January 1 to December 31, 2018. The tests were searched by order code and any multi-
22 allergen panel containing > 1 food was included; multi-allergen panels with environmental
23 aeroallergens that did not include foods were excluded. For comparison, provider specialty was

recorded as allergist vs non-allergist (primary care and other pediatric subspecialists). This project was deemed exempt from institutional IRB review.

During 2018, 12,354 sIgE tests were ordered by 400 unique providers, including 13 allergists at our institution and 41 external (community) allergists. Among all tests, 10,981 (89%) were single food allergen sIgE and 1,373 (11%) were panels containing food sIgE. Commonly ordered individual foods were peanut (815), egg white (792) and milk (638). The most common panel was the “food allergy panel” which was ordered 1494 times and includes 11 foods (clam, cod, corn, egg, milk, peanut, scallop, shrimp, soy, walnut and wheat). The “childhood allergy panel” which includes 6 foods (cod, milk, egg, peanut, soy and wheat) combined with 5 inhalant allergen sIgEs was ordered a total of 170 times. Among individual sIgE tests, the most commonly associated diagnosis was “allergy to other foods: (n=2070), “food allergy” (1541) and peanut-allergy related diagnoses such as “anaphylaxis to peanut” (746), followed by “eosinophilic esophagitis” (419) and “dermatitis to an ingested food” (399). The top 3 diagnoses associated with orders for sIgE panels containing foods were “dermatitis, unspecified” (n= 105), “allergy to other foods” (103) and “unspecified abdominal pain” (78).

Allergists ordered 8,986 tests, of which only 110 (1.2%) were panels, whereas non-allergists ordered 3,368 of which 1,263 (37.5%) were panels ($p < 0.0001$). Community allergists (N=71) ordered more FA panels compared with those at our academic center (N=13); (1.9% vs 0.75%; $p < 0.0001$). As shown in Figure 1, among all ordering providers, significantly more FA panels were ordered by allergist and non-allergist community providers (n=1199; 17.4%) compared with providers at our academic institution (n=175; 3.2%; $p < 0.0001$).

Compared to our previous study, we found similar numbers of single allergen sIgE tests ordered in 2013 (n=10,794) and 2018 (n=10,981) by a similar number of individual clinicians

(447 in 2013 compared with 400 providers in 2018). However, there was a 55% decrease in the overall number of panels ordered in 2018 (n=1,373) versus 2013 (n=3,065). There was a 40% reduction in the number of “food allergy panel” orders (2,496 in 2013 compared with 1,494 in 2018) and a 62% decrease in the number of “childhood allergy panel” orders (from 450 to 170). There was no change in the foods included in each panel between the two studies.

It is reassuring that the number of food allergy panels ordered has decreased as indiscriminate use of these panels is not recommended.^{5,6} In addition to the low positive predictive value of sIgE as a screening test, many more individuals will have detectable IgE sensitization to foods than symptomatic reactions, possibly leading to over-diagnosis of FA or inappropriate dietary elimination.⁷ Misdiagnosis of FA has other potential consequences including risk of nutritional deficiencies due to food avoidance and increased healthcare costs.³ These costs include the direct health care costs such as initial allergy consult visit, skin testing, oral food challenge and injectable epinephrine as well as potential costs, including dietary changes or substitutes, expensive elemental formulas, time missed from work and patient/caregiver anxiety. In patients without a clinical history of FA who are detected by a screening sIgE panel, these costs are avoidable.

The reasons for the decrease in the total number of food allergen panels ordered is likely multifactorial. Specific initiatives to educate providers about this issue have increased in our institution since publication of the initial study, including grand rounds and lectures for house staff and non-allergy providers within our institution. This may explain why there were fewer sIgE panels ordered by non-allergist academic providers within our institution compared with non-allergist community providers. It is unlikely that the decrease in the number of panels ordered represents a decrease in the number of patients evaluated for food allergy as the number

of individual sIgE tests was unchanged. Cost is also not likely to have been a factor as the cost of the “panel” tests in our laboratory is equivalent to the sum of the individual sIgE tests included, thereby not incentivizing providers to choose panels over individual allergens.

Although fewer panels containing food sIgE were ordered in 2018 compared to 2013, this follow-up study demonstrates that there are still a substantial number of such panels ordered yearly. Additionally, these tests continue to be ordered for concerns that may not be related to IgE-mediated food allergy, as evidenced by two of the top three associated diagnoses for the panel tests being “dermatitis” and “abdominal pain.” The vast majority of those ordering multi-food allergy panels are non-allergist community providers, suggesting room for improvement and community-wide education. With this data demonstrating on-going use of these allergy panels, our institution has been able to work with our reference laboratory to eliminate preselected panels containing food allergy sIgE. Next steps include studying future provider ordering practices for food allergy tests without the option for preselected panels. Other areas for future study include analyzing the results of food sIgE tests, determining whether the patient is eventually diagnosed with food allergy and defining the potential economic impact. Ultimately, this information can help allergists engage with and educate primary care providers and pediatric subspecialists in the appropriate ordering and interpreting these tests.

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Figure 1. Proportion of food allergy sIgE tests ordered as single vs panel tests, by provider

type. The majority of all food sIgE tests ordered were individual foods (n= 10,981, 89%).

Allergists ordered sIgE most frequently (8,986 individual and panel sIgE; solid and dashed black, respectively). Non-allergists (gray) who ordered food allergy sIgE tests tended to have a significantly higher proportion ordered as panels (dashed gray; 37.5%) compared with allergists (dashed black; 1.2%), $p<0.0001$.

Tests Ordered by Provider Type as Single sIgE (solid) or Panel sIgE (dashed)

