Siemens Healthineers IMMULITE 2000 3gAllergy Assay and Thermo Fisher Scientific IMMUNOCAP Assay

Predicting Peanut Allergy in an Unbiased Allergy Clinic Population Using Peanut-specific IgE Levels Measured in Two Independent Assays*

Santos CB[1], Lanser BJ[1], Strand MJ[1], Gelfand EW[1].

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Clinical Brief

**This clinical brief is a copy of the poster that describes research findings from a prospective cohort study conducted at the National Jewish Health hospital in Denver, Colorado. The study abstract was published in the Journal of Allergy and Clinical Immunology[4] and the data was presented at the poster session at the American Academy of Allergy, Asthma & Immunology meeting in 2018.*

[1] National Jewish Health, Denver, CO.

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Abstract

Rationale: Prior studies establishing diagnostic decision points associated with high probability of failing a double-blind, placebo-controlled (DBPC) oral food challenge (OFC) utilized selected, highly atopic populations, and food allergy was not consistently confirmed via OFC. The study assessed the performance characteristics of two diagnostic tests to predict peanut allergy determined by DBPC OFC in children representing a more general allergy clinic population.

Methods: Patients with a history of physician-diagnosed peanut allergy and positive skin prick test (SPT) and/or detectable serum specific IgE (sIgE) by IMMUNOCAP assay from Thermo Fisher Scientific were recruited for this prospective study. Patients with severe atopic dermatitis or asthma were excluded. Subjects had IMMUNOCAP and Siemens Healthineers IMMULITE® 2000 sIgE assay levels drawn and underwent graded DBPC OFC to peanut. A fitted logistic regression model expressed the probability of an allergic reaction; 95% positive predictive values (PPVs) and 50% negative predictive values (NPVs) were calculated. Receiver operating curves were constructed and area under the curve computed to compare each test's ability to predict clinical peanut allergy.

Results: 51 subjects, ages 3–20 years (median = 8) underwent peanut DBPC OFC; 30 subjects failed (58.8%). IMMULITE peanut sIgE and IMMUNOCAP Ara h 2 component testing performed similarly and were superior to the IMMUNOCAP crude peanut sIgE assay in predicting peanut allergy. Our resultant 95% PPV for peanut allergy via IMMUNOCAP assay (80.3 kUA/L) is higher than previously published values.

Conclusion: These results, generated from a unique population, proved valuable for the diagnosis of peanut allergy in a general allergy clinic population. This suggests that sIgE to Ara h 2 by IMMUNOCAP assay or peanut sIgE by IMMULITE assay may be the most accurate tests for diagnosing and predicting peanut allergy.

Rationale

Available diagnostic tests for food allergy, including skin prick testing (SPT) and specific IgE (sIgE), are limited by poor specificity. Prior studies that have established diagnostic sIgE and SPT values to predict the likelihood of clinically relevant peanut allergy utilized selected, highly atopic populations, and food allergy was not consistently confirmed via DBPC OFC.

Various commercial food sIgE assays differ in their composition, source of extracts, and method of assay calibration. sIgE levels from different commercial assays are often discrepant, and published predictive values cannot be applied to results from other assays.

This study sought to establish clinical predictive values for peanut allergy using different diagnostic assays and compared the accuracy of the tests in an unbiased allergy clinic population.

Methods

Subjects ages 3 to 21 years with physician-diagnosed peanut allergy and/or detectable peanut sIgE were recruited.

Exclusion criteria: severe atopic dermatitis or severe asthma.

Crude peanut and peanut component sIgE using the IMMUNOCAP assay and whole peanut sIgE using the IMMULITE 2000/2000 XPi 3gAllergy™ assay were measured. DBPC OFC to peanut flour (cumulative 5g of peanut protein) was performed in all subjects. If OFC was passed, subjects consumed an open dose of peanut 7g protein. A fitted logistic regression model expressed the probability of an allergic reaction, and 95% PPV and 50% NPV were calculated using SAS v9.4. Receiver operating curves (ROC) were constructed and area under the curve (AUC) computed to compare each test's ability to predict clinical peanut allergy.

Results†

Table 1. Patient demographics and testing results in subjects who underwent peanut DBPC OFC, separated into the pass/fail groups.

	n = 51	Pass (n = 21, 41.2%)	Fail (n = 30, 58.8%)
Age (years) Mean [SD; range]	8.73 [4; 3–20]	8.52 [3.89; 4–17]	8.87 [4.08; 3–20]
White Race	40 (78.4%)	17 (81%)	23 (76.6%)
Asthma	25 (49%)	10 (47.6%)	15 (50%)
AD	19 (37.3%)	6 (28.6%)	13 (43.4%)
Allergic Rhinitis	34 (66.7%)	13 (61.9%)	21 (70%)
Prior Reaction	35 (68.6%)	12 (57.1%)	23 (76.7%)
Multi-food Allergy	17 (33.3%)	7 (33.3%)	10 (33.3%)
SPT (mm) Mean [SD; range]	13.5 [6.8; 1.5–28.5]	7.9 [3.6; 1.5–15.5]	17.5 [5.5; 7–28.5]
Peanut IgE (kUA/L) IMMUNOCAP	12.2 [23.8; <0.35–>100]	2.2 [2.82; <0.35–12.3]	19.1 [29.14; <0.35–>100]
Peanut IgE (kUA/L) IMMULITE	18.69 [32.44; <0.1–>100]	2.75 [4.39; <0.1–19.17]	29.9 [38.58; 0.79–>100]
Ara h 2 IgE (kUA/L) IMMUNOCAP	9.4 [23.08; <0.1–>100]	5.1 [21.97; <0.1–>100]	12.52 [23.74; <0.1–>100]

There were no statistically significant differences in demographics or atopy status between the pass/fail groups.
†Results from case studies are not predictive of results in other cases. Results in other cases may vary.

The IMMULITE peanut sIgE and IMMUNOCAP Ara h 2 IgE assays performed similarly and were superior to the IMMUNOCAP peanut sIgE assay in predicting peanut allergy. SPT using commercial peanut extract was the most accurate test:

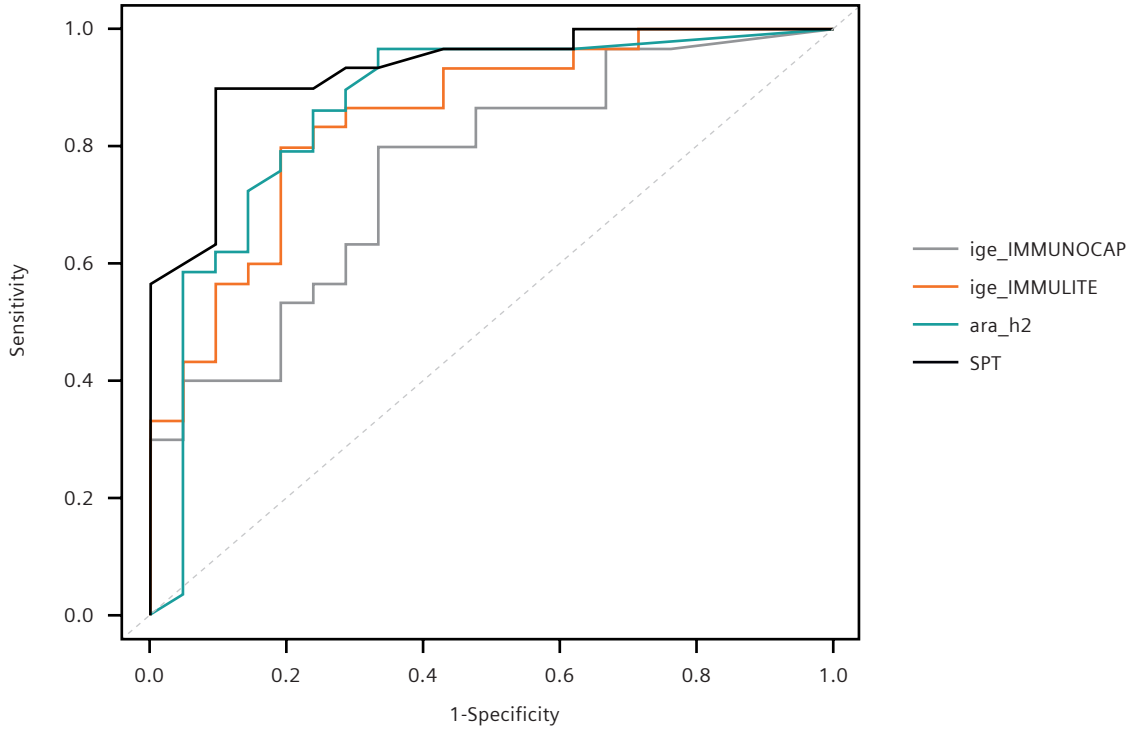

Figure 1. Receiver operating curves (ROC) to compare each test's ability to predict clinical peanut allergy.

Table 2. Computed area under the curve (AUC) to compare each test's ability to predict clinical peanut allergy.

	Area Under the Curve (AUC)
SPT Peanut	0.93
IMMUNOCAP Ara h 2 IgE	0.87
IMMULITE Peanut IgE	0.85
IMMUNOCAP Peanut IgE	0.76

Table 3. Comparison of 50% NPVs and 95% PPVs to predict peanut allergy to commonly cited values, when available.

	95% PPV	50% NPV
IMMUNOCAP sIgE Prior Studies[1-3]	14 kUA/L	2 kUA/L
IMMUNOCAP sIgE This Cohort	80.4 kUA/L	1.4 kUA/L
IMMULITE sIgE This Cohort	33.5 kUA/L	2.3 kUA/L
SPT Wheal Prior Studies[1-3]	8 mm	3 mm
SPT Wheal This Cohort	17 mm	11 mm

Conclusion

Ara h 2 IgE measured by IMMUNOCAP assay or peanut sIgE by IMMULITE assay may be the most accurate serum tests for diagnosing or predicting clinically relevant peanut allergy. Overall, SPT was the most accurate test to diagnose peanut allergy.

Using a combination of skin and serum tests should be considered to improve diagnostic accuracy for peanut allergy.

The differences in 95% PPV and 50% NPV between this cohort and prior studies indicate that further study is warranted to establish valid cutoff values for these assays.

The major strengths of this study include:

- The authors enrolled a moderately atopic cohort, compared to the highly atopic cohorts in prior studies.
- This cohort may be more representative of a general allergy clinic population.
- All subjects underwent a DBPC OFC, regardless of peanut sIgE level.

The limitations of this study include:

- Small sample size.
- Potential selection bias: Parents whose children had relatively low peanut sIgE may have been more likely to enroll in the study.

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The conclusions made by the study authors and the data presented reflect studies that were performed at National Jewish Health Hospital in Denver, Colorado. Results obtained at individual laboratories may vary from the data presented. Each laboratory should verify performance characteristics per their established testing protocols. The data presented herein do not reflect performance claims of assays offered by Siemens Healthineers. Refer to the assay Instructions for Use for performance claims validated by Siemens Healthineers.

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Siemens Healthineers Headquarters
Siemens Healthcare GmbH
Henkestr. 127
91052 Erlangen, Germany
Phone: +49 9131 84-0
siemens-healthineers.com

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Siemens Healthcare Diagnostics Inc.
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511 Benedict Avenue
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USA
Phone: +1 914-631-8000

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