Test Definition: MUXF3

MUXF3 (Cross-reactive Carbohydrate Determinant), IgE, Serum

Overview

Useful For

Evaluation for the presence of antibodies to cross-reactive carbohydrate determinates

Investigation of clinically unexpected positive IgE antibody testing in a wide variety of plant and invertebrate allergens

This test is **not useful for** patients previously treated with immunotherapy to determine if residual clinical sensitivity exists or in patients in whom the medical management does not depend upon identification of allergen specificity.

Special Instructions

- Allergens - Immunoglobulin E (IgE) Antibodies

Highlights

The presence of IgE antibodies to cross-reactive carbohydrate determinants (CCD), such as bromelain-derived MUXF3, are associated with broad cross-reactivity with many plant and invertebrate allergens (including peanut allergens).

The presence of antibodies to CCD are generally not associated with allergenic symptoms but can cause confounding positive specific IgE antibody tests to a broad variety of allergens.

Method Name

Fluorescence Enzyme Immunoassay (FEIA)

NY State Available

Yes

Specimen

Specimen Type

Serum

Ordering Guidance

For a listing of allergens available for testing, see Allergens - Immunoglobulin E (IgE) Antibodies

Specimen Required

Supplies: Sarstedt Aliquot Tube, 5 mL (T914)
Collection Container/Tube:
Preferred: Serum gel
Acceptable: Red top
Submission Container/Tube: Plastic vial

Specimen Volume: 0.5 mL for every 5 allergens requested
Collection Instructions: Centrifuge and aliquot serum into a plastic vial.

Forms

If not ordering electronically, complete, print, and send an Allergen Test Request (T236) with the specimen.

Specimen Minimum Volume

For 1 allergen: 0.3 mL
For more than 1 allergen: (0.05 mL x number of allergens) + 0.25 mL deadspace

Reject Due To

Gross hemolysis	OK
Gross lipemia	OK
Gross icterus	OK

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Serum	Refrigerated (preferred)	14 days	
	Ambient	7 days	
	Frozen	90 days	

Clinical & Interpretive

Clinical Information

Antibodies to glycoprotein carbohydrate determinants are prone to interact with a broad variety of plant and invertebrate allergens. These glycoprotein carbohydrates have therefore been termed cross-reactive carbohydrate determinants (CCD). The MUXF3 carbohydrate epitope obtained from digested pineapple bromelain glycoprotein can be used as a representative epitope marker for assessing the presence of IgE antibodies that interact with CCD. As true allergic sensitization to the pineapple bromelain glycoprotein itself is rare, assessing for the presence IgE antibodies reactive with the bromelain MUXF3 CCD glycoprotein carbohydrate epitope serves as a well-established marker for the determination of the presence of anti-CCD IgE antibodies.

Cross-reactive carbohydrate determinants epitopes are widely distributed in plants and invertebrate animals, and antibodies against CCD, such as MUXF2, may be associated with a number of positive IgE antibody tests (cross-reactivity) to many different and unrelated plant allergens, but also to a number of potential invertebrate allergens such as bee/wasp venom, cockroaches, mites, and shellfish. Plant protein allergens that contain CCD epitopes include peanuts, grass, pollen, and latex. The presence of anti-CCD IgE antibodies can hinder assessment of the presence of IgE antibodies to these other plant and invertebrate allergens, as it is not possible to distinguish whether observed reactivity is due to the presence of antibodies specific to other proteins or is the result of the presence of interfering anti-CCD antibodies. When very broad allergen sensitivity profiles are observed in the course allergy testing, it may be due to the presence of

cross-reactive anti-CCD IgE antibodies, although the presence of IgE antibodies to profilin proteins should also be considered.

The degree to which antibodies to CCD may be associated with clinical allergic reaction has not been completely resolved. In general, the presence of cross-reactive antibodies to CCD, such as MUXF3, is not thought to be clinically relevant and does not give rise to symptoms consistent with allergic reaction. However, antibodies to CCD may be linked to clinically relevant allergic reactions in extremely rare cases, including in individuals with celery and tomato allergy.

Reference Values

Class	IgE kU/L	Interpretation
0	<0.10	Negative
0/1	0.10-0.34	Borderline/equivocal
1	0.35-0.69	Equivocal
2	0.70-3.49	Positive
3	3.50-17.4	Positive
4	17.5-49.9	Strongly positive
5	50.0-99.9	Strongly positive
6	> or =100	Strongly positive

Reference values apply to all ages.

Concentrations of 0.70 kU/L or more (class 2 and above) will flag as abnormally high.

Interpretation

Antibody to bromelain MUXF3 has widely been used for assessing for potential cross-reactive carbohydrate determinate (CCD) cross-reactivity since its CCD chain is also found in many other plant proteins, including peanuts. While sensitization to CCD is generally not associated with an allergic reaction, the presence of IgE antibodies to CCD may give rise to confounding positive IgE antibody sensitization profiles for a wide variety of plant and invertebrate allergens.

Cautions

Some individuals with clinically insignificant sensitivity to allergens may have measurable levels of IgE antibodies in serum, and test results must be interpreted in the clinical context.

False-positive results for IgE antibodies may occur in patients with markedly elevated serum IgE (>2500 kU/L) due to nonspecific binding to allergen solid phases.

Clinical Reference

1. Altmann F. Coping with cross-reactive carbohydrate determinants in allergy diagnosis. Allergo J Int. 2016;25(4):98-105. doi:10.1007/s40629-016-0115-3
2. Hemmer W, Altmann F, Holzweber F, Gruber C, Wantke F, Wohrl S. ImmunoCAP cellulose displays cross-reactive carbohydrate determinant (CCD) epitopes and can cause false-positive test results in patients with high anti-CCD IgE antibody levels. J Allergy Clin Immunol. 2018;141(1):372-381.e3. doi:10.1016/j.jaci.2017.04.028
3. Sinson E, Ocampo C, Liao C, et al. Cross-reactive carbohydrate determinant interference in cellulose-based IgE allergy tests utilizing recombinant allergen components. PLoS One. 2020;15(4):e0231344. doi:10.1371/journal.pone.0231344
4. van Ree R. Clinical importance of cross-reactivity in food allergy. Curr Opin Allergy Clin Immunol. 2004;4:235-40

5. Fotish K, Altmann F, Haustein D, Vieths S. Involvement of carbohydrate epitopes in the IgE response of celery-allergic patients. Int Arch Allergy Immunol. 1999;120:30-42. doi:10.1159/000024217

Performance

Method Description

Specific IgE from the patient's serum reacts with the allergen of interest, which is covalently coupled to an ImmunoCAP. After washing away nonspecific IgE, enzyme-labeled anti-IgE antibody is added to form a complex. After incubation, unbound anti-IgE is washed away, and the bound complex incubated with a developing agent. After stopping the reaction, the fluorescence of the eluate is measured. Fluorescence is proportional to the amount of specific IgE present in the patient's sample (ie, the higher the fluorescence value, the more IgE antibody is present).(Package insert: ImmunoCAP System Specific IgE FEIA. Phadia; Rev 02/2024)

PDF Report

No

Day(s) Performed

Monday through Friday

Report Available

Same day/1 to 3 days

Specimen Retention Time

14 days

Performing Laboratory Location

Mayo Clinic Laboratories - Rochester Superior Drive

Fees & Codes

Fees

- Authorized users can sign in to Test Prices for detailed fee information.
- Clients without access to Test Prices can contact Customer Service 24 hours a day, seven days a week.
- Prospective clients should contact their account representative. For assistance, contact Customer Service.

Test Classification

This test has been cleared, approved, or is exempt by the US Food and Drug Administration and is used per manufacturer's instructions. Performance characteristics were verified by Mayo Clinic in a manner consistent with CLIA requirements.

CPT Code Information

86008

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
MUXF3	MUXF3 (CCD), IgE, S	58984-6

Result ID	Test Result Name	Result LOINC® Value
MUXF3	MUXF3 (CCD), IgE, S	58984-6