Test Definition: ALGAL

Galactose-Alpha-1,3-Galactose (Alpha-Gal), IgE, Serum

Overview

Useful For

As an aid in diagnosis of an IgE mediated hypersensitivity allergy to non-primate mammalian red meat, such as beef, pork, venison, and meat-derived products (eg, gelatin)

This test is **not useful in** patients previously treated with immunotherapy to determine if residual clinical sensitivity exists.

This test is **not useful for** patients in whom medical management does not depend upon identification of allergen specificity.

Special Instructions

- Allergens - Immunoglobulin E (IgE) Antibodies

Highlights

The presence of IgE antibodies against galactose-alpha-1,3-galactose (alpha-gal) is associated with red meat allergy.

Individuals with IgE antibodies against alpha-gal might develop anaphylactic reactions to the drug cetuximab.

Method Name

Fluorescence Enzyme Immunoassay (FEIA)

NY State Available

Yes

Specimen

Specimen Type

Serum

Ordering Guidance

Other meat allergen IgE antibody tests may be considered in addition to galactose-alpha-1,3-galactose IgE antibody testing in cases of suspected red meat allergy.

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 1 of the following forms with the specimen:
-Allergen Test Request (T236)
-Microbiology Test Request (T244)

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

Specimen Stability Information

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

Clinical & Interpretive

Clinical Information

Immunoglobulin E antibodies to galactose-alpha-1,3-galactose (alpha-gal), a carbohydrate commonly expressed on non-primate mammalian proteins, are capable of eliciting allergenic reactions.

Sensitization may occur through tick bites or exposure to the drug cetuximab. In the United States, individuals bitten by *Amblyomma americanum*, also known as the Lone Star tick, may develop IgE antibodies to alpha-gal, although sensitization to alpha-gal through other tick species has also been implicated.(1) The Lone Star tick was historically localized to the southern and southeastern United States but has now expanded its range into the central Midwest and northwards along the eastern seaboard. It is thought to be responsible for most cases of alpha-gal sensitization in the United States. The tick species that appears to be responsible for these responses in France is *Ixodes ricinus*, while in Australia it is *Ixodes holocyclus*.(2,3,4)

Signs and symptoms of an alpha-gal allergic reaction are often delayed compared with other food allergies. Upon exposure of sensitized subjects to non-primate mammalian meat (eg, beef, pork, venison) or meat-derived product such

as gelatin, a delayed allergic response may ensue, often 3 to 6 hours after ingestion. Symptoms can include urticaria, angioedema, difficulty breathing, abdominal pain, vomiting, and even anaphylactic shock.

Individuals who have antibodies produced against alpha-gal following a tick bite or previous exposure to the drug cetuximab may experience anaphylaxis when given cetuximab. Cetuximab is a monoclonal antibody, which contains an alpha-gal epitope on the antigen binding fragment (Fab fragment) of the monoclonal drug. Unlike the delayed onset anaphylaxis associated with red meat consumption, individuals with IgE antibody response to alpha-gal can experience immediate onset anaphylaxis upon intravenous cetuximab administration.

Although most sensitizations to alpha-gal occur later in life, children who develop IgE antibodies to alpha-gal may also experience anaphylaxis and urticaria 3 to 6 hours after eating mammalian meat. Unlike their adult counterparts, who frequently present with anaphylaxis, the majority of children with this syndrome present with urticaria. Alpha-gal can also be found in mammalian milk, including cow and goat milk.

In vitro serum testing for IgE antibodies provides an indication of the immune response to allergens that may be associated with allergic disease.

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

Concentrations of 0.70 Ku/L or more (Class 2 and above) will flag as abnormally high
Reference values apply to all ages.

Interpretation

Detection of IgE antibodies in serum (class 1 or greater) indicates an increased likelihood of allergic disease as opposed to other etiologies and defines the allergens that may be responsible for eliciting signs and symptoms.

The level of IgE antibodies in serum varies directly with the concentration of IgE antibodies expressed as a class score or kU/L.

Cautions

Some individuals with clinically insignificant sensitivity to allergens may have measurable levels of IgE antibodies in serum, and 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. Berg EA, Platts-Mills TAE, Commins SP. Drug allergens and food--the cetuximab and galactose-alpha-1,3-galactose story. Ann Allergy Asthma Immunol. 2014;112(2):97-101
2. Commins SP, Platts-Mills TAE. Delayed anaphylaxis to red meat in patients with IgE Specific for Galactose alpha-1,3-Galactose (alpha-gal). Curr Allergy Asthma Rep. 2013;13(1):72-77
3. Commins SP, James HR, Kelly LA, et al. The relevance of tick bites to the production of IgE antibodies to the mammalian oligosaccharide galactose-alpha-1,3-galactose. J Allergy Clin Immunol. 2011;127(5):1286-93.e6. doi:10.1016/j.jaci.2011.02.4. Wolver SE, Sun DR, Commins SP, Schwartz LB. A peculiar cause of anaphylaxis: no more steak? The journey to discovery of a newly recognized allergy to galactose-alpha-1,3-galactose found in mammalian meat. J Gen Intern Med. 2013;28(2):322-325
5. Commins SP, Platts-Mills TAE. Tick bites and red meat allergy. Curr Opin Allergy Clin Immunol. 2013;13(4):354-359
6. Hamsten C, Starkhammar M, Tran TA, et al. Identification of galactose-alpha-1,3-galactose in the gastrointestinal tract of the tick Ixodes ricinus; possible relationship with red meat allergy. Allergy. 2013;68(4):549-552
7. Steinke JW, Platts-Mills TAE, Commins SP: The alpha-gal story: lessons learned from connecting the dots. J Allergy Clin Immunol. 2015;135(3):589-597
8. Crispell G, Commins SP, Archer-Hartman SA, Choudhary S, Dharmarajan G, Azadi P, Karim S: Discovery of alpha-gal-containing antigens in North American tick species believed to induce red meat allergy. Front Immunol. 2019 17;10:1056
9. Homburger HA, Hamilton RG: Allergic diseases. In: McPherson RA, Pincus MR, eds. Henry's Clinical Diagnosis and Management by Laboratory Methods. 23rd ed. Elsevier; 2017:1057-1070

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 AB; 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
ALGAL	Galactose-alpha-1,3-galactose, IgE	73837-7

Result ID	Test Result Name	Result LOINC® Value
ALGAL	Galactose-alpha-1,3-galactose, IgE	73837-7