

Dog Dander, IgE, with Reflex to Dog Dander Components, IgE, Serum

#### Overview

#### **Useful For**

Evaluating patients with suspected dog dander allergy

#### **Reflex Tests**

Test Id	Reporting Name	Available Separately	Always Performed
DOGPR	Dog Dander Components,	No	No
	IgE, S		

## **Testing Algorithm**

Testing begins with analysis of dog dander IgE. If dog dander IgE is negative (<0.10 kU/L), testing is complete.

If dog dander IgE is 0.10 kU/L or more, then 6 dog dander components (Can f 1, Can f 2, Can f 3, Can f 4, Can f 5, Can f 6) are performed at an additional charge.

## **Special Instructions**

• Allergens - Immunoglobulin E (IgE) Antibodies

#### **Highlights**

The determination of the relative amount of IgE antibody to total dog dander and IgE antibodies to specific dog dander components, may aid in assessment of the potential strength and type of allergenic response to dog dander.

IgE antibody to total dog dander extract will initially be tested.

If detectable total specific dog dander IgE antibody is present, additional component dog dander allergen antibody testing will be performed. This is comprised of testing for IgE antibodies to the potential allergens Can f 1, Can f 2, Can f 3, Can f 4, Can f 5, and Can f 6.

### **Method Name**

Fluorescent Enzyme Immunoassay (FEIA)

#### **NY State Available**

Yes

## **Specimen**

#### **Specimen Type**

Serum



Dog Dander, IgE, with Reflex to Dog Dander Components, IgE, 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: 1 mL

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**

0.7 mL

#### **Reject Due To**

Gross	OK
hemolysis	
Gross lipemia	OK
Gross icterus	OK

#### **Specimen Stability Information**

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

#### Clinical & Interpretive

### **Clinical Information**

Dog (canine) dander allergy is one of the most common epidermal allergies in the United States, with an estimated prevalence of sensitization of approximately 10%. Overall, allergies to dogs and cats may afflict up to 20% of the world's population, and the prevalence appears to be increasing over time. The assessment of dog allergen-related sensitivity and allergy is dependent upon the presence of compatible clinical symptoms in the context of exposure, with support from identification of potential canine-specific IgE allergen antibodies either by skin testing or in vitro serology testing.

There is a correlation between elevated total dog (canine) IgE allergen antibodies and an increased likelihood of a clinical allergic response. Once an elevated antibody response to total dog dander IgE extract is established, assessment for the



Dog Dander, IgE, with Reflex to Dog Dander Components, IgE, Serum

presence of specific IgE antibodies to the most common dog allergenic components will be performed, which can yield additional, potentially useful information for clinical assessment of dog allergy and sensitization. During dog component allergen IgE antibody testing, the presence of IgE antibodies specific for potentially allergenic individual proteins, namely *Canis familiaris* allergen (Can f) 1, Can f 2, Can f 3, Can f 4, Can f 5, and Can f 6, are individually assessed. The determination of the relative amount of IgE antibody to specific dog components can aid in assessment of the potential strength and type of allergenic response. However, the correlation between total serum IgE testing and skin testing is not ideal, with estimates of 52% concordance. In vitro testing has generally focused on assessing for the presence of total IgE serum antibodies to total dog allergen extracts and has overall estimated sensitivities of 75% in symptomatic individuals.

Canis familiaris allergen 1 is a major allergen and is a salivary lipocalin protein found in all homes with dogs. Particles containing Can f 1 can remain airborne and can be inhaled. Several studies have demonstrated that approximately half of the individuals with dog allergies have IgE antibodies directed exclusively to the Can f 1 component. Increasing IgE antibody concentrations against lipocalins, such as Can f 1, correlates with the severity of asthma. Sensitization to Can f 1 in childhood was significantly associated with symptoms to dog allergy at age 16 years, and high levels of antibodies to Can f 1 were strongly associated with asthma in a population-based study of 19 year olds. Can f 1 is the most dominant dog allergen, although only 64% of individuals who are allergic to dogs react to Can f 1. While Can f 1 can be reliably used to identify dog-allergic individuals who sensitized to Can f 1, sensitivity for detecting potential dog allergy (and allergen sensitization) increases if multiple allergen components are assayed.

Canis familiaris allergen 2 is a salivary lipocalin protein and an allergen present in dog hair and dander. Sensitivity to Can f 2 is associated with high levels of bronchial inflammation and is more common among patients with severe asthma. It is believed that sensitized patients with reactivity to Can f 2 will always react to Can f 1.

Canis familiaris allergen 3 is a serum albumin allergen found in dog dander, hair, epithelia, saliva, and in house dust and is considered an intermediate dog allergy component. Sensitization to Can f 3 is associated with increased risks of current asthma, current allergic rhinitis, and concomitant asthma and allergic rhinitis.(1) There is observed cross-reactivity of Can f 3 patient IgE antibodies with albumins from many species, including the cat allergen Fel d 2, which may cause sensitization.

Canis familiaris allergen 4 is the most abundantly detected allergen in dog fur and a major allergen component of dog hair and dander extracts. Sensitization to the lipocalin Can f 4 is associated with asthma and serves as a marker for clinically relevant dog allergy. Assessment of antibodies to Can f 4, in combination with other dog allergens, may improve the reliability of dog allergy assessment.

Canis familiaris allergen 5 is a prostatic kallikrein component of dog hair and dander produced by intact (unneutered) male dogs. Approximately two-thirds of individuals who are allergic to canines demonstrate IgE reactivity to Can f 5. Additionally, a substantial proportion of those individuals are monosensitized to Can f 5 and react specifically to intact male dogs rather than female dogs or castrated male dogs. Sensitization to Can f 5 is associated with asthma and rhinoconjunctivitis symptoms and can contribute to polysensitization in individuals with IgE responses to multiple animal allergen molecules. Due to cross-reactivity with prostate-specific antigen of human seminal plasma, sensitization to Can f 5 may also contribute to the occurrence of human sexual disorders, including infertility.

Canis familiaris allergen 6 is a major dog allergen present in dog dander. Sensitization to Can f 6 is associated with



Dog Dander, IgE, with Reflex to Dog Dander Components, IgE, Serum

dog-related rhinitis and asthma. Can f 6 shares extensive cross-reactivity with other mammalian lipocalins, particularly cat and horse, and thus contributes to multi-animal allergic sensitization and potential resulting clinical respiratory symptoms.

Polysensitization to multiple allergens should be considered during the evaluation of dog component assay results. In a study of 75 patients with clinical allergy, the majority exhibited IgE antibodies reactive with Can f 1 and Can f 2. Asthma and decreased lung function were most strongly associated with sensitization to a group of 27 components, including Can f 1, Can f 2, and Can f 3. Polysensitization to 3 or more allergen molecules from dogs was a better predictor of dog allergy-related symptoms than results of IgE antibody tests utilizing total dog allergen extracts. Most dog-sensitized children are reactive to more than one dog allergen component, with co-sensitization to Can f 5 and Can f 1/Can f 2 conferring higher asthma risks. Reducing canine exposure should be considered if co-reactivity to these components is present.

**Table. Specific Dog Allergens** 

Allergen	Most common reaction type	Selected potential cross-reactivity
		with other allergens
Can f 1	One of the major dog component	Some cross-reactivity with cat
(lipocalin)	allergens.	component Fel d 7, which is a
	For individuals with clinical allergy	lipocalin
	symptoms to dogs, approximately half	
	show antibody reactivity to Can f 1.	
	Increased severity of asthma	
	symptoms.	
Can f 2	Bronchial inflammation	Can f 1, limited cross-reactivity with
(lipocalin)	-Sensitivity to Can f 2 is associated	Fel d 4
	with high levels of bronchial	
	inflammation and is more common	
	among patients with severe asthma.	
	-Sensitized patients with reactivity to	
	Can f 2 will also react to Can f 1.(2,3)	
Can f 3	Sensitization to Can f 3 is associated	Antibodies against this component
(serum	with increased risks of asthma and	may indicate cross-reactivity
albumin)	allergic rhinitis.	associated with albumins from
	Serum albumins are a minor allergen	humans, pigs, cattle, cats (Fel d 2),
	in animal dander but can play a	sheep, horses, mice, and rats.
	significant role as cross-reacting	
	allergens.	
Can f 4	Asthma	Minor cross-reactivity with Can f 1,
(lipocalin)	-Sensitization to lipocalins such as Can	Can f 2, Equ c 1, Fel d 4
	f 4 are associated with asthma	
	-Can f 4 is considered a major allergen	
	component of dog dander	
Can f 5	Asthma, rhinoconjunctivitis symptoms	Same protein family as cows, horses,
(kallikrein)	-In the absence of other component	rats, rabbits, mice, and guinea pigs.



Dog Dander, IgE, with Reflex to Dog Dander Components, IgE, Serum

	sensitization, there may be reduced/absent allergic symptoms in the presence of female or neutered male dogs.	There is no observed cross-reactivity between Can f 5 and Can f 1, Can f 2, or Can f 3.(1) Can f 5 cross-reacts with prostate-specific antigen (PSA) of human seminal plasma.
Can f 6 (lipocalin)	Dog-related rhinitis and asthma	Can f 6 lipocalin sensitized individuals may also react to horse and cat lipocalins. This can be responsible for co-sensitization among these animals.

#### **Reference Values**

Class	IgE kU/L	Interpretation
0	<0.10	Negative
0/1	0.10-0.34	Borderline/equivoc
		al
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

When detectable total dog dander IgE antibody is present (> or =0.10 IgE kUa/L), additional specific component IgE antibody testing will be performed. If at least one potential specific allergenic dog dander component IgE is detectable (> or =0.10 IgE kUa/L), an interpretative report will be provided.

When the sample is negative for total dog dander IgE antibody (<0.10 IgE kUa/L), additional testing for specific dog component IgE antibodies will not be performed. Negative IgE results for total dog dander antibody may indicate a lack of sensitization to potential dog allergenic components.

#### **Cautions**

Clinical correlation of results from in vitro IgE testing with patient history of allergic or anaphylactic responses to dogs is recommended.

- -Negative results for IgE to total dog dander and any dog allergenic components do not completely exclude the possibility of clinically relevant allergic responses upon exposure to dog dander.
- -Positive results for IgE to total dog dander or any potential dog allergenic components are not diagnostic for dog allergy and only indicate patient may be sensitized to dog dander or a cross-reactive allergen.



Dog Dander, IgE, with Reflex to Dog Dander Components, IgE, Serum

Testing for IgE antibodies may not be useful in patients previously treated with immunotherapy to determine if residual clinical sensitivity exists or in patients whose medical management does not depend upon the identification of allergen specificity.

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. Mattsson L, Lundgren T, Everberg H, Larsson H, Lidholm J. Prostatic kallikrein: a new major dog allergen. J Allergy Clin Immunol. 2009;123(2):362-368
- 2. Davila I, Dominguez-Ortega J, Navarro-Pulido A, et al. Consensus document on dog and cat allergy. Allergy. 2018;73(6):1206-1222. doi:10.1111/all.13391
- 3. Nilsson OB, Binnmyr J, Zoltowska A, Saarne T, van Hage M, Gronlund H. Characterization of the dog lipocalin allergen Can f 6: the role in cross-reactivity with cat and horse. Allergy. 2012;67(6):751-757
- 4. Konieczny A, Morgenstern JP, Bizinkauskas CB, et al. The major dog allergens, Can f 1 and Can f 2, are salivary lipocalin proteins: cloning and immunological characterization of the recombinant forms. Immunology. 1997;92(4):577-586
- 5. Schou C, Svendsen UG, Lowenstein H. Purification and characterization of the major dog allergen, Can f I. Clin Exp Allergy. 1991;21(3):321-328
- 6. Bjerg A, Winberg A, Berthold M, Mattsson L, Borres MP, Ronmark E. A population-based study of animal component sensitization, asthma, and rhinitis in schoolchildren. Pediatr Allergy Immunol. 2015;26(6):557-563
- 7. Konradsen JR, Fujisawa T, van Hage M, et al. Allergy to furry animals: New insights, diagnostic approaches, and challenges. J Allergy Clin Immunol. 2015;135(3):616-625
- 8. Spitzauer S, Pandjaitan B, Soregi G, et al. IgE cross-reactivities against albumins in patients allergic to animals. J Allergy Clin Immunol. 1995;96(6 Pt 1):951-959
- 9. Chruszcz M, Mikolajczak K, Mank N, Majorek KA, Porebski PJ, Minor W. Serum albumins-unusual allergens. Biochim Biophys Acta. 2013;1830(12):5375-5381
- 10. Nwaru BI, Suzuki S, Ekerljung L, et al. Furry animal allergen component sensitization and clinical outcomes in adult asthma and rhinitis. J Allergy Clin Immunol Pract. 2019;7(4):1230-1238.e4
- 11. Schoos AM, Kattan JD, Gimenez G, Sampson HA. Sensitization phenotypes based on protein groups and associations to allergic diseases in children. J Allergy Clin Immunol. 2016;137(4):1277-1280
- 12. Rytkonen-Nissinen M, Saarelainen S, Randell J, Hayrinen J, Kalkkinen N, Virtanen T. IgE reactivity of the dog lipocalin allergen Can f 4 and the development of a sandwich ELISA for its quantification. Allergy Asthma Immunol Res. 2015;7(4):384-392
- 13. Schoos AM, Bonnelykke K, Chawes BL, Stokholm J, Bisgaard H, Kristensen B. Precision allergy: Separate allergies to male and female dogs. J Allergy Clin Immunol Pract. 2017;5(6):1754-1756
- 14. Basagana M, Bartolome B, Pastor-Vargas C, Mattsson L, Lidholm J, Labrador-Horrillo M. Involvement of Can f 5 in a case of human seminal plasma allergy. Int Arch Allergy Immunol. 2012;159(2):143-146
- 15. Chan SK, Leung DYM. Dog and cat allergies: Current state of diagnostic approaches and challenges. Allergy Asthma Immunol Res. 2018;10(2):97-105. doi:10.4168/aair.2018.10.2.97
- 16. Salo PM, Arbes SJ Jr, Jaramillo R, et al. Prevalence of allergic sensitization in the United States: results from the National Health and Nutrition Examination Survey (NHANES) 2005-2006. J Allergy Clin Immunol. 2014;134(2):350-359. doi:10.1016/j.jaci.2013.12.1071



Dog Dander, IgE, with Reflex to Dog Dander Components, IgE, Serum

#### **Performance**

## **Method Description**

Specific IgE from the patient's serum reacts with the allergen of interest, 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 <u>Test Prices</u> for detailed fee information.
- Clients without access to Test Prices can contact <u>Customer Service</u> 24 hours a day, seven days a week.
- Prospective clients should contact their account representative. For assistance, contact <u>Customer Service</u>.

## **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**

86003

#### **LOINC®** Information



Dog Dander, IgE, with Reflex to Dog Dander Components, IgE, Serum

Test ID	Test Order Name	Order LOINC® Value
DOGPF	Dog Dander Component Reflex, S	6098-8

Result ID	Test Result Name	Result LOINC® Value
DOGD1	Dog Dander, IgE, S	6098-8