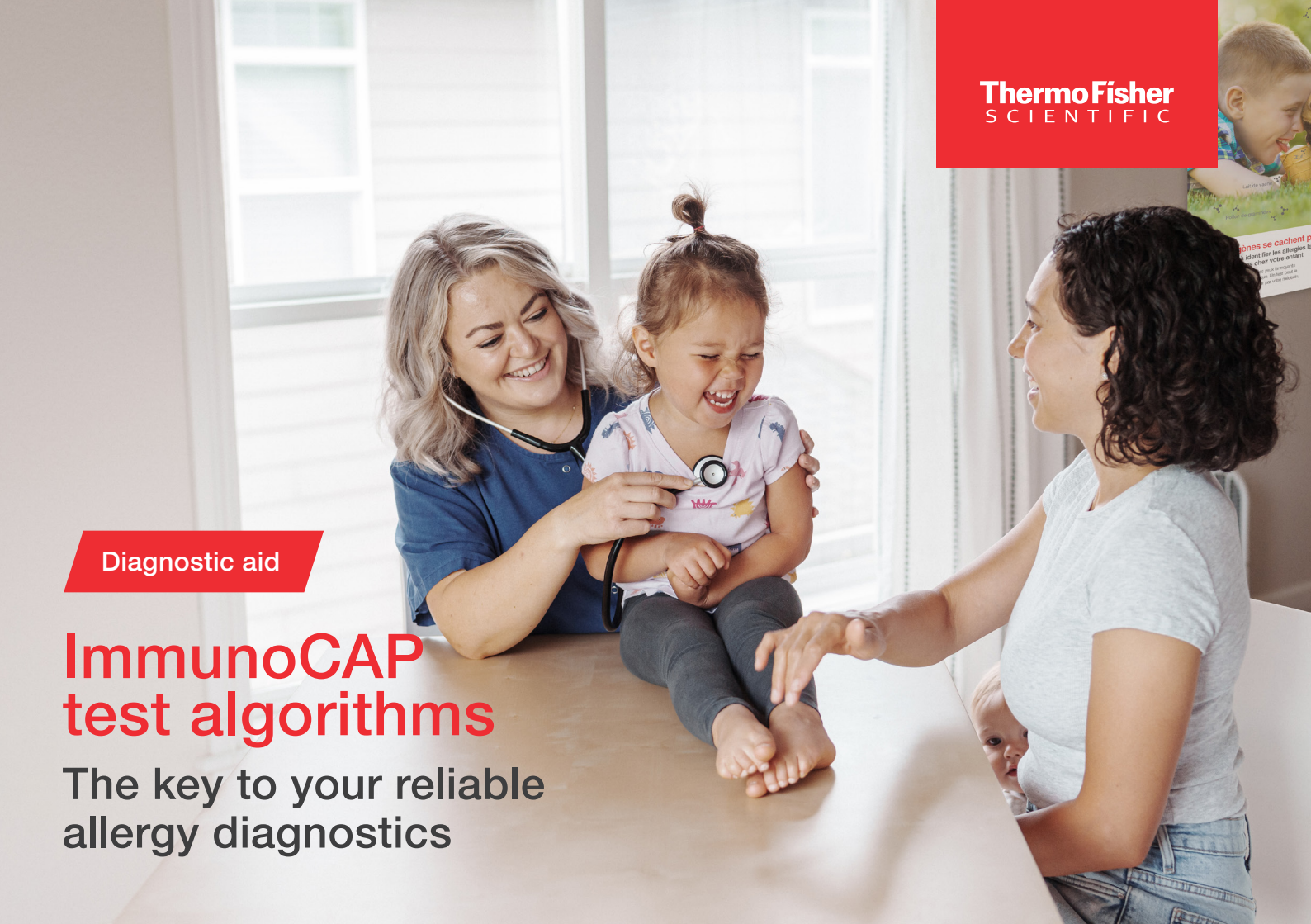


ThermoFisher SCIENTIFIC

Diagnostic aid

ImmunoCAP test algorithms

The key to your reliable allergy diagnostics

Introducing the ImmunoCAP test algorithms

This collection has been designed to provide a comprehensive overview of the ImmunoCAP™ test algorithms. We aim to support your allergy practice by suggesting appropriate diagnostic pathways to help you define the sensitisation profile of a patient suspected of type 1 allergies.

Within the following pages, you will discover test algorithms based on international guidelines and recommendations, coupled with the latest scientific findings in the field. We hope these resources will serve as valuable tools to help you more effectively diagnose allergic diseases.

Dive deep into these algorithms and suggested pathways for diagnosing seasonal and perennial respiratory allergies, food allergies, venom allergies, allergic asthma, and much more.

A definitive clinical diagnosis of IgE mediated allergic disorders should only be made by the physician, based on the clinical history for the individual patient after all clinical and laboratory findings have been evaluated. It should not be based on the results of any single diagnostic method alone.

Please note also that the test algorithms presented here are just some of the diagnostic approaches that may be indicated or possible, and additional clinical and diagnostic tests can be often necessary for a final diagnosis.

The references included were selected based on best available information and their clinical relevance. This booklet should not be used as medical advice or a diagnosis guide. Please use the content of this booklet in conjunction with other relevant data such as independent studies, guidelines and medical recommendations.

Thermo Fisher Scientific is proud to provide the full range of ImmunoCAP™ Specific IgE blood tests in compliance with regulation (EU) 2017/746 for In-vitro Diagnostic Medical Devices (IVDR).*

We wish you the best of success with your allergy diagnostics – enjoy the read.

Disclaimer: The information contained in this document is not to be taken as medical advice and a diagnosis can only be determined by a certified medical provider with an understanding of the patient's medical history and clinical context. * conformity assessment by EU Notified Body GMED (0459)

Contents

Pollen allergy

Suggested test profile for tree, grass and weed pollen sensitisations

ImmunoCAP™ Whole Allergens
Confirm or exclude the suspected allergy with the relevant tree, grass and weed pollen[1–4]

ImmunoCAP Allergen Components
Differentiate between primary sensitisation and cross-reactivity[1–3,5–8]

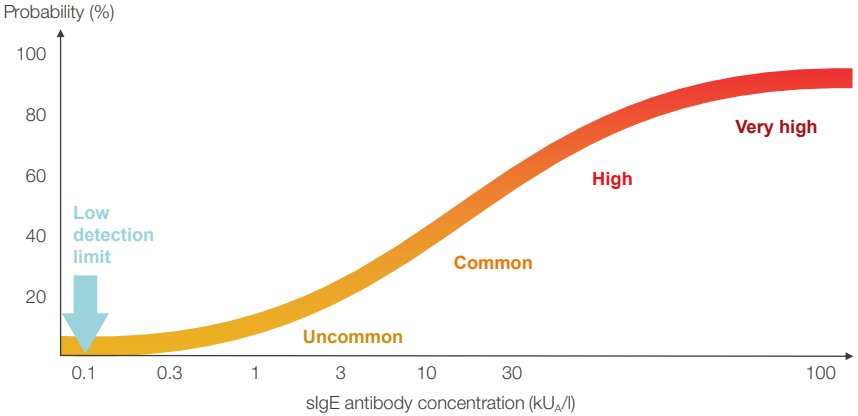
Allergen sources			Primary sensitisers		Cross-reactive allergens	
Tree pollen	Birch	t3	Bet v 1	t215	Bet v 2*	t216
	Ash / Olive	t25 / t9	Ole e 1	t224	Bet v 4*	t220
	Cypress / mountain juniper	t23 / t6	Cup a 1**	t226	rBet v 2/Bet v 4*	t221
	Plane tree	t11	Pla a 1	t241	MUXF3 CCD**	o214
Grass pollen	Timothy grass	g6	Phl p 1	g205	Phl p 7*	g210
	Bermuda grass	g2	Phl p 5b	g215	Phl p 12*	g212
			Phl p 1/Phl p 5b	g213	Phl p 7/Phl p 12	g214
			Cyn d 1**	g216	MUXF3 CCD**	o214
Weed pollen	Mugwort	w6	Art v 1	w231		
	Ragweed	w1	Amb a 1	w230		
	Wall pellitory	w21	Par j 2	w211		
	Plantain	w9	Pla l 1	w234		
	Saltwort	w11	Sal k 1**	w232		

If clinical symptoms are present with exposure to tree / grass and weed pollen, there's a high probability of clinical allergy. Consider pollen exposure reduction and prescription of allergen immunotherapy (AIT).[1–3,5–9]

Unclear AIT efficiency, especially if no pollen-specific sensitisation is found. Continue searching for the primary sensitiser.[1–3,8,9]

* Birch or timothy profilins (Bet v 2, Phl p 12) and polcalcins (Bet v 4, Phl p 7) can replace the corresponding components in other pollen due to the strong structural similarity.[2,7,8] ** Glycoproteins contain cross-reactive carbohydrate determinants (CCD). IgE antibodies only against CCD (such as on MUXF3) are usually not clinically relevant.[6,7]

ImmunoCAP Specific IgE tests: quantitative test results you can trust, enabled through high-quality standards



Positive test results

≥ 0.10 kU$_A$/l indicates sensitisation, especially in, but not limited to, young children. Even very low values indicate a risk of allergy symptoms.[13,14]

Factors to consider for a final diagnosis[4–17]

- Age
- Degree of atopy
- Allergen load
- Type of sensitising allergens
- Previous symptoms
- Family medical history

Why use ImmunoCAP Specific IgE tests?[15,16]

- ✓ Can be used in any patient, irrespective of medication, condition or season
- ✓ No risk of adverse reaction (anaphylaxis)
- ✓ Quantitative blood test

Clinical value of quantitative ImmunoCAP Specific IgE testing

Diagnosis

Quantitative measurement of allergen specific IgE antibodies, using the ImmunoCAP Specific IgE assay provides an indication of the risk for clinical reactions to an allergen and assists in the identification of offending allergens for avoidance measures.[19]

Prognosis

In general, the higher the IgE antibody level, the higher the risk of developing allergies. Since early sensitisation can be predictive of future allergies development, it's crucial to have highly sensitive and specific IgE tests, allowing accurate identification of sensitising allergens already in young children.[20,21]

Follow-up

Specific IgE blood testing results help follow the changes in the patient's allergic status over time.[18,19]

References: 1. Barber D, et al. Allergy 2021;00:1-17. **2.** Kleine-Tebbe J, et al. Allergol Select 2021;5:180-186. **3.** Kleine-Tebbe J, et al. Immunol Allergy Clin N Am 2016;36:191-203. **4.** Scadding GK, et al. Immunol Allergy Clin North Am 2016;36(2):249-260. **5.** Ansotegui I J, et al. World Allergy Organization Journal 2020;13:100091. **6.** Dramburg S, et al. Pediatr Allergy Immunol 2023;34(Suppl 28):e13854. **7.** Kleine-Tebbe J, et al. Molecular Allergy Diagnostics Springer International Publishing Switzerland 2017. **8.** Pfaar O, et al. Allergol Select 2022;6:167-232. **9.** Schmid-Grendelmeier P. Der Hautarzt 2010;61(11):946-953. **10.** Sampson H A. J Allergy Clin Immunol 2001;107(5):891-896. **11**. Shek L P, et al. J Allergy Clin Immunol 2004;114(2):387-391. **12.** Söderström L, et al. Allergy 2003;58(9):921-928. **13.** Thorpe M, et al. J Allergy Clin Immunol Pract 2023. **14.** Van Hage M, et al. J Allergy Clin Immunol 2017;140(4):974-977. **15.** Ciprandi C, et al. Ann Allergy Asthma Immunol 2014;112(2):184e185. **16.** Siles R I, et al. Cleve Clin J Med 2011;78(9):585-592. **17.** Walsh J, et al. The British journal of general practice: the journal of the Royal College of General Practitioners 2011;61(588):473-475. **18.** Worm M, et al. Allergologie select 2021;5:195-243. **19.** Hamilton RG, et al. J Allergy Clin Immunol 2010;126(1):33-8. **20.** Yunginger JW, et al. J Allergy Clin Immunol 2000;105(6pt1):1077-1084. **21.** Boyce J, et al. Journal of the American Dietetic Association 2011.

Official product names: ImmunoCAP Allergen t3, Common silver birch; ImmunoCAP Allergen t215, Allergen component rBet v 1, PR-10, Birch; ImmunoCAP Allergen t9, Olive; ImmunoCAP Allergen t224, Allergen component rOle e 1, Olive; ImmunoCAP Allergen t23, Cypress; ImmunoCAP Allergen t226, Allergen component nCup a 1, Cypress; ImmunoCAP Allergen t11, London plane tree; ImmunoCAP Allergen t241, Allergen component rPla a 1, London plane tree; ImmunoCAP Allergen g6, Timothy; ImmunoCAP Allergen g205, Allergen component rPhl p 1, Timothy; ImmunoCAP Allergen g215, Allergen component rPhl p 5b, Timothy; ImmunoCAP Allergen g2, Bermuda grass; ImmunoCAP Allergen g216, Allergen component nCyn d 1, Bermuda grass; ImmunoCAP Allergen w6, Mugwort; ImmunoCAP Allergen w231, Allergen component nArt v 1, Mugwort; ImmunoCAP Allergen w1, Ragweed; ImmunoCAP Allergen w230, Allergen component nAmb a 1, Ragweed; ImmunoCAP Allergen w21, Wall pellitory; ImmunoCAP Allergen w211, Allergen component rPar j 2, LTP, Wall pellitory; ImmunoCAP Allergen w9, Plantain; ImmunoCAP Allergen w234, Allergen component rPla l 1, Plantain; ImmunoCAP Allergen w11, Saltwort; ImmunoCAP Allergen w232, Allergen component nSal k 1, Saltwort; ImmunoCAP Allergen o214, Allergen component MUXF3 CCD, Bromelain; ImmunoCAP Allergen g213, Allergen component rPhl p 1, rPhl p 5b Timothy; ImmunoCAP Allergen g210, Allergen component rPhl p 7 Timothy; ImmunoCAP Allergen g212, Allergen component rPhl p 12 Profilin; ImmunoCAP Allergen g214, Allergen component rPhl p 7, rPhl p 12; ImmunoCAP Allergen t216, Allergen component rBet v 2 Profilin; ImmunoCAP Allergen t220, Allergen component rBet v 4 Birch; ImmunoCAP Allergen t221, Allergen component rBet v 2, rBet v 4 Birch; ImmunoCAP Allergen t25, European Ash; ImmunoCAP Allergen t6, Mountain juniper

Birch pollinosis

ImmunoCAP Specific IgE tests

Birch, belonging to *Betulaceae* family, is one of the most common tree species producing pollen allergens in Europe.[1] Birch pollen is one of the main causes of asthma, allergic rhinoconjunctivitis and allergic rhinitis symptoms and the sensitisation to birch pollen has been found to be prevalent in the range from 8 to 16% in European countries.[2]

ImmunoCAP Whole Allergen

Birch (t3)

ImmunoCAP Allergen Components

Bet v 1 (t215) – PR-10

Primary sensitiser

- Major allergen
- Likely to cause cross-reaction with other PR-10 allergens, from, e.g. fruits, nuts, vegetables[1–12]
- Indicator for allergen immunotherapy (AIT) suitability

Bet v 2 (t216)
Profilin

Bet v 4 (t220)
Polcalcin

Bet v 6 (t225)
Isoflavone reductase like

Minor allergens

- Cross-reactive allergens
- May not be available in sufficient amounts in AIT extracts[1,3–12]
- Sensitisation to cross-reactive minor allergens only – not suitable for AIT[1,3–12]

Allergen immunotherapy

The success of AIT depends heavily on whether a patient is sensitised against major allergens like Bet v 1.[1–12]

Pollen food allergy syndrome

Proteins structurally related to PR-10, such as the major birch allergen (Bet v 1), are found in tree pollen of the order Fagales, fruits, nuts and vegetables. Sensitisation to major tree pollen allergens can lead to allergic symptoms of the lips and mouth (swelling, redness, tingling) when eating raw fruits, nuts, and vegetables.[13]

Whole extract Birch	**Primary sensitiser** Bet v 1	**Cross-reactive allergens** Bet v 2# / Bet v 4# / Bet v 6	**Interpreting results***	**Management considerations**
+/−	+	+/−	• Primary birch sensitisation is likely • Likely cross-reaction with other PR-10 allergens from, e.g. fruits, nuts, vegetables[1–12]	• Consider prescription of AIT • Birch pollen exposure reduction • Consider targeted antihistamines around birch season • Consider assessing risk of reaction to fruits, nuts and vegetables[1–12]
+/−	−	+	• Sensitisation to cross-reactive minor allergens[1,3–12] • The primary allergen source should be identifed[1]	• Not suitable for AIT • Consider further investigations to identify the primary allergen • Consider targeted antihistamines around birch season[1,3–12]
+	−	−	If all components of the algorithm are negative and t3 is positive, the patient could be sensitised to an untested allergen. As such, in the context of clinical history, exposure reduction may still be recommended.[4]	

* Results should always be interpreted in the context of the clinical history. # Profilin (Bet v 2, Phl p 12) and polcalcin (Bet v 4, Phl p 7) from birch and Timothy grass can be used as marker for almost all pollen due to structural similarity.[18]

References: 1. Dramburg S, et al. Pediatr Allergy Immunol 2023;34(Suppl 28):e13854. **2.** Biedermann T, et al. Allergy 2019;74(7):1237-1248. **3.** Hatzler L, et al. J Allergy Clin Immunol 2012;130(4):894–901 e5. **4.** Barber D, et al. Allergy 2008;63(11):1550–1558. **5.** Sekerkova A, et al. Allergol Int 2012;61(2):339–346. **6.** Tripodi S, et al. J Allergy Clin Immunol 2012;129(3): 834–839 e8. **7.** Cipriani F, et al. Allergy 2017. **8.** Hauser M, et al. Allergy Asthma Clin Immunol 2010;6(1):1. **9.** Schmid-Grendelmeier P. Der Hautarzt 2010;61(11):946-953. **10.** Focke M, et al. Clin Exp Allergy 2008;38(8):1400–1408. **11.** Walker SM, et al. Clin Exp Allergy 2011;41(9): 1177– 1200. **12.** Valenta R, et al. J Investig Allergol Clin Immunol 2007;17(Suppl 1):36–40. **13.** Manzanares, et al. Front Allergy 2023. **14.** Akdis CA, Agache I. (Eds.) Global atlas of allergy 2014.

Official product names: ImmunoCAP Allergen t3, Common silver birch; ImmunoCAP Allergen t215, Allergen component rBet v 1 PR-10, Birch; ImmunoCAP Allergen t216, Allergen component rBet v 2 Profilin, Birch; ImmunoCAP Allergen t220, Allergen component rBet v 4, Birch; ImmunoCAP Allergen t225, Allergen component rBet v 6, Birch

Grass pollinosis

ImmunoCAP Specific IgE tests

Grass pollen is one of the principal causes of respiratory allergic diseases globally. The IgE reactivity to these allergens is manifested by about 40% of allergic patients and 20% of the general population. Grass pollen season overlaps with weed pollen, in most parts of Europe, but also with tree pollen, especially in southern Europe.[1]

ImmunoCAP Whole Allergens

ImmunoCAP Allergen Components

Timothy grass (g6)

Bermuda grass (g2)

Phl p 1 (g205)
Grass group 1

Phl p 5b (g215)
Grass group 5

Cyn d 1 (g216)
Grass group 1, CCD-bearing protein

Primary sensitisers

- Major and specific Timothy grass allergens
- More than 90% of patients with sensitisation to grass pollen have IgE to Phl p 1 and/or Phl p 5[1–15]
- Indicator for allergen immunotherapy (AIT) suitability

Primary sensitiser

- Major allergen
- Marker for genuine sensitisation to Bermuda grass[1,2]
- Indicator for allergen immunotherapy (AIT) suitability

Phl p 7 (g210)
Polcalcin

Phl p 12 (g212)
Profilin

Cross-reactive allergens

- Often minor allergens which may not be available in sufficient amount in the AIT extract.[7]
- Sensitisation to minor allergens such as Phl p 7 in addition to major components indicates more complex sensitisation profiles and has been associated with more severe symptoms and longer duration of disease.[7]

Whole extract Timothy grass / Bermuda grass	**Primary sensitisers** Phl p 1 / Phl p 5b	**Cross-reactive allergens** Phl p 7 / Phl p 12#	**Primary sensitisers** Cyn d 1	**Interpreting results***	**Management considerations**
+/−	+	+/−	−	• Primary Timothy grass sensitisation is likely • Sensitisation to Phl p 1 usually precedes other grass pollen component sensitisation in the development of rhinitis symptoms[1–15]	• Consider prescription of AIT • Grass pollen exposure reduction • Targeted antihistamines around Timothy grass pollen season[1–15]
+/−	−	+/−	+	• Primary sensitisation to Bermuda grass is likely when CCD sensitisation is excluded.[1,2]	• Consider prescription of AIT • Grass pollen exposure reduction • Targeted antihistamines around Bermuda grass pollen season[1]
+/−	−	+	−	• Sensitisation to cross-reactive minor allergens[7–15] • Primary sensitiser should be identified	• Consider further investigations to identify the primary allergen • Grass pollen exposure reduction • Consider targeted antihistamines around grasspollen season[7–15]
+	−	−	−	If all components of the algorithm are negative and g6/g2 is positive, the patient could be sensitised to an untested allergen. As such, in the context of clinical history, exposure reduction may still be recommended.[1]	

* Results should always be interpreted in the context of the clinical history. # Profilin (Bet v 2, Phl p 12) and polcalcin (Bet v 4, Phl p 7) from birch and Timothy grass can be used as marker for almost all pollen due to structural similarity.[16]

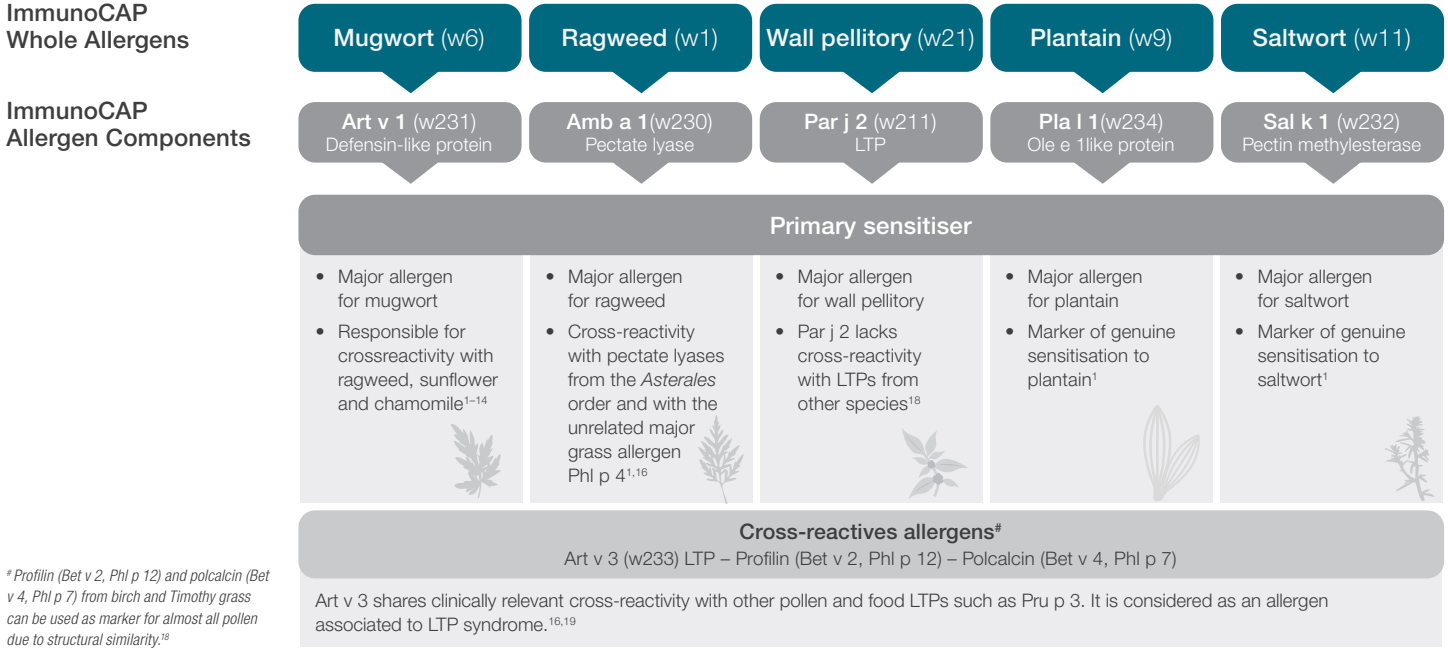
References: 1. Dramburg S, et al. Pediatr Allergy Immunol 2023;34(Suppl 28):e13854. **2.** Barber D, et al. Allergy 2008;63(11):1550–1558. **3.** Fuertes E, et al. J Allergy Clin Immunol 2023. **4.** Barreto, et al. Front. Allergy, Sec. Allergy Diagnosis 2023. **5.** Sekerkova A, et al. Allergol Int 2012;61(2):339–346. **6.** Tripodi S, et al. J Allergy Clin Immunol 2012;129(3):834–839 e8. **7.** Cipriani F, et al. Allergy 2017. **8.** Hauser M, et al. Allergy Asthma Clin Immunol 2010;6(1):1. **9.** Schmid-Grendelmeier P. Der Hautarzt 2010;61(11):946-953. **10.** Focke M, et al. Clin Exp Allergy 2008;38(8):1400–1408. **11.** Almeida. et al. Allergologia et Immunopathologia 2019; Volume 47, Issue 6. **12.** Valenta R, et al. J Investig Allergol Clin Immunol 2007;17(Suppl 1):36–40. **13.** Canonica GW, et al. World Allergy Organization Journal 2013;6(1):17. **14.** Asero R, et al. Eur Ann Allergy Clin Immunol 2012;44(5):183-187. **15.** Kleine-Tebbe J and Jakob T. Springer International Publishing Switzerland 2017. **16.** Akdis CA, Agache I (Eds.) Global atlas of allergy 2014.

Official product names: ImmunoCAP Allergen g6, Timothy grass; ImmunoCAP Allergen g205, Allergen component rPhl p 1, Timothy; ImmunoCAP Allergen g215, Allergen component rPhl p 5b, Timothy; ImmunoCAP Allergen g210, Allergen component rPhl p 7 Polcalin, Timothy; ImmunoCAP Allergen g212, Allergen component rPhl p 12 Profilin, Timothy; ImmunoCAP Allergen g2, Bermuda grass; ImmunoCAP Allergen g216, Allergen component nCyn d 1 Bermuda grass

Weed pollinosis

ImmunoCAP Specific IgE tests

The term “weed” does not constitute a botanical family, but rather refers to diverse plants used as culinary herbs, medicinal plants that are ecologically adaptive as well as invasive segetal plants.[1] Weed allergy related symptoms can be unclear and difficult to diagnose due to frequent poly-sensitisations, and inconclusive anamnesis due to overlapping flowering seasons with other pollens such as birch and grass. Cross-reactions are expected between different weed species when botanically closely related.[1,2]



 # Profilin (Bet v 2, Phl p 12) and polcalcin (Bet v 4, Phl p 7) from birch and Timothy grass can be used as marker for almost all pollen due to structural similarity.[18]

Whole extracts	Allergen components	Interpreting results*	Management considerations
Mugwort	Art v 1	Primary sensitation to mugwort is likely[1-13]	• Consider prescription of allergen immunotherapy (AIT) with mugwort pollen • Weed pollen exposure reduction[1-13]
	Art v 3	Primary sensitation to mugwort and LTP syndrome likely[16-19]	• Patient well to moderately suitable for AIT with mugwort • Weed pollen exposure reduction[1-13]
Ragweed	Amb a 1	Primary sensitation to ragweed is likely[1-13]	• Consider prescription of AIT with ragweed pollen • Weed pollen exposure reduction[1-13]
Wall pellitory	Par j 2 	Primary sensitation to wall pellitoryis likely[1, 20]	• Consider prescription of AIT with wall pellitory pollen[1, 20] • Weed pollen exposure reduction[1-13]
Plantain	Pla l 1	Primary sensitation to plantain is likely[1, 2]	• Consider prescription of AIT with plantain pollen[1, 2] • Weed pollen exposure reduction[1-13]
Saltwort	Sal k 1	Primary sensitation to saltwort is likely[1, 21]	• Consider prescription of AIT with saltwort pollen[1, 21] • Weed pollen exposure reduction[1-13]

* Results should always be interpreted in the context of the clinical history.

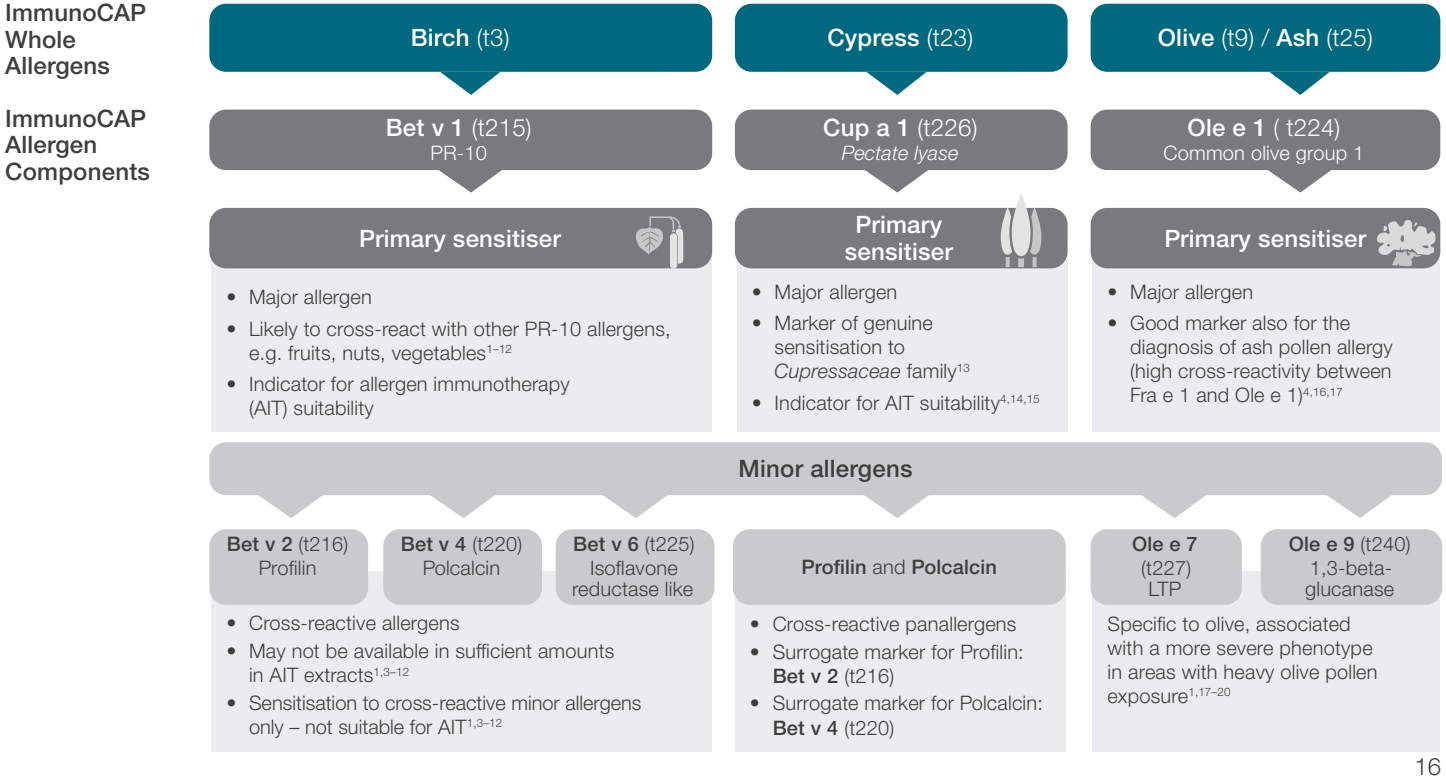
References: 1. Dramburg S, et al. Pediatr Allergy Immunol 2023;34(Suppl 28):e13854. **2.** Gadermaier, G, et al. Methods 2014;66;55-66. **3.** Forkel, et al. Int Arch Allergy Immunol 2020;181(2):128-135. **4.** Asero, R, et al. Ann Allergy Asthma Immunol 2014;113:307-313. **5.** Liao, et al. Front. Peridatr 2022;10:816354. **6.** Cosi V, et al. Curr Allergy Asthma Rep 2023;23(6):277-285. **7.** Egger M, et al. Allergy 2006;61:461-476. **8.** Gao Z, et al. Allergy 2019;74(2):284-293 **9.** Zbîrcea LE, et al. Int J Mol Sci 2023;24(4):4040. **10.** Schmid-Grendelmeier P. Hautarzt 2010;61(11):946-953. **11.** Canonica GW, et al. World Allergy Organization Journal 2013;6(1):17.7. **12.** Asero R. Eur Ann Allergy Clin Immunol 2012;44(5):183-187. **13.** Kleine-Tebbe, J. and Jakob, T. Editors: Molecular Allergy Diagnostics. Springer International Publishing Switzerland 2017. **14.** Leonard R, et al. J Biol Chem 2010;285(35):27192-200. **15.** Pichler U, et al. PLoS One 2015;10(5):e0120038. **16.** Wopfner N, et al. Int Arch Allergy Immunol 2005;138(4):337-346. **17.** Zhao L, et al. Clin Transl Allergy 2020;10(1): p. 50. **18.** Asero R, et al. Clin exp Allergy 2018;48(1):6-12. **19.** Scheurer S, et al. 2021;21(2):7. **20.** Gonzalez-Rioja R, et al. Clin Exp Allergy 2007;37(2): p. 243-250. **21.** Barderas R, et al. Clin Exp Allergy 2007;37(7): p. 1111-1119.

Official product names: ImmunoCAP Allergen w1, Common ragweed; ImmunoCAP Allergen w6, Mugwort; ImmunoCAP Allergen w21, Wall pellitory; ImmunoCAP Allergen w9, Plantain (English), Ribwort; ImmunoCAP Allergen w11, Saltwort (prickly), Russian thistle; ImmunoCAP Allergen w230, Allergen component Arnb a 1, Ragweed; ImmunoCAP Allergen w231, Allergen component Art v 1, Mugwort; ImmunoCAP Allergen w233, Allergen component Art v 3 LTP, Mugwort; ImmunoCAP Allergen w211, Allergen component Par j 2 LTP, Wall pellitory; ImmunoCAP Allergen w234, Allergen component Pla l 1, Plantain; ImmunoCAP Allergen w232, Allergen component Sal k 1, Saltwort

Late winter/spring pollinosis

ImmunoCAP Specific IgE tests

Spring pollinosis is primarily caused by tree pollen. Tree pollen season starts in winter already, typically lasting from January to May. It often overlaps with grass pollen in the late spring and summer, as well as with perennial allergens.



Whole extract Birch	Primary sensitiser Bet v 1	Cross-reactive allergens Bet v 2# / Bet v 4# / Bet v 6	Interpreting results*	Management considerations
+/−	+	+/−	• Primary birch sensitisation is likely • Likely cross-reaction with other PR-10 allergens, e.g., in fruits, nuts, vegetables[1–12]	• Consider prescription of AIT • Birch pollen exposure reduction • Consider targeted antihistamines around birch season • Consider assessing risk of reaction to fruits, nuts and vegetables[1–12]
+/−	−	+	• Sensitisation to cross-reactive minor allergens[1,3–12] • The primary allergen source should be identifed[4]	• Not suitable for AIT • Consider further investigations to identify the primary allergen • Consider targeted antihistamines around birch season[1,3–12]
+	−	−	If all components of the algorithm are negative and t3 is positive, the patient could be sensitised to an untested allergen. As such, in the context of clinical history, exposure reduction may still be recommended.[4]	

* Results should always be interpreted in the context of the clinical history. # Profilin (Bet v 2, Phl p 12) and polcalcin (Bet v 4, Phl p 7) from birch and Timothy grass can be used as marker for almost all pollen due to structural similarity.[13]

Allergen immunotherapy

The success of AIT depends largely on whether a patient is sensitised to major allergens such as Bet v 1.[1–12]

Pollen food allergy syndrome

Proteins structurally related to the major birch allergen (Bet v 1) are found in trees of Fagales order, fruits, nuts, and vegetables. Sensitisation to tree pollen can lead to allergic symptoms of the lips and mouth (swelling, redness, tingling) when eating raw fruits, nuts, and vegetables.[20]

Whole extracts Olive / Ash	**Primary sensitiser** Ole e 1	**Cross-reactive allergens** Ole e 7 / Ole e 9	**Interpreting results***	**Management considerations** 
+/−	+	+/−	• Primary olive/ash allergy is likely[4,16–20]	• Consider prescription of AIT • Tree pollen exposure reduction[4,16–20]
+/−	−	+	Sensitisation to minor allergens associated with a more severe respiratory phenotype in areas with heavy olive pollen exposure[1,17–20]	• Not suitable for AIT (the allergen composition of olive pollen extracts for AIT may vary significantly, especially with respect to Ole e 7 and Ole e 9[1]) • Olive exposure reduction[1,17–20]
+	−	−	If all components of the algorithm are negative and t9 or t25 is positive, the patient could be sensitised to an untested allergen. As such, in the context of clinical history, exposure reduction may still be recommended.[4]	

Whole extract Cypress	**Primary sensitiser** Cup a 1	**Cross-reactive allergens#** Polcalcin/ Profilin	**Interpreting results***	**Management considerations** 
+/−	+	+/−	• Primary cypress allergy is likely[4,14,15]	• Consider prescription of AIT • Cypress pollen exposure reduction[4,14,15]
+/−	−	+	• Sensitisation to cross-reactive minor allergens • The primary allergen should be identifed[4]	• Not suitable for AIT[4] • Consider further investigations to identify the primary allergen
+	−	−	If all components of the algorithm are negative and t23 is positive, the patient might be sensitised to an untested allergen. As such, in the context of clinical history, exposure reduction may still be recommended.[4]	

* Results should always be interpreted in the context of the clinical history. #Profilin (Bet v 2, Phl p 12) and Polcalcin (Bet v 4, Phl p 7) from birch and Timothy grass can be used as marker for almost all pollen due to structural similarity. In patients with suspected pollen-food cross-reactivity due to gibberellin-regulated proteins, Pru p 7 is the currently available marker.[14]

References: 1. Barber D, et al. Allergy 2008;63(11):1550–1558. **2.** Andersson K, et al. International Archives of Allergy & Immunology 2003;130(2):87–107. **3.** Hatzler L, et al. J Allergy Clin Immunol 2012;130(4):894–901 e5. **4.** Dramburg S, et al. Pediatr Allergy Immunol 2023;34(Suppl 28):e13854. **5.** Sekerkova A, et al. Allergol Int 2012;61(2):339–346. **6.** Tripodi S, et al. J Allergy Clin Immunol 2012;129(3):834–839 e8. **7.** Cipriani F, et al. Allergy 2017. **8.** Hauser M, et al. Allergy Asthma Clin Immunol 2010;6(1):1. **9.** Schmid-Grendelmeier P. Der Hautarzt 2010;61(11):946-953. **10.** Focke M, et al. Clin Exp Allergy 2008;38(8):1400–1408. **11.** Walker SM, et al. Clin Exp Allergy 2011;41(9):1177– 1200. **12.** Valenta R, et al. J Investig Allergol Clin Immunol 2007;17(Suppl 1):36–40. **13.** Klingebiel C, et al. Clin Exp Allergy 2019;49(4):526-536. **14.** Klingebiel C, et al. Rev Fr Allergol 2016;56:452-461. **15.** Arilla MC, et al. Int Arch Allergy Immunol 2004;134(1):10-16. **16.** Gadermaier G, et al. Methods 2014;66;55-66. **17.** Asero R, et al. Ann Allergy Asthma Immunol 2014;113:307-313. **18.** Santos AF, et al. Allergy 2019. **19.** Alonso, et al. J Investig Allergol Clin Immunol 2023. **20.** Manzanares et al. Front. Allergy 2023.

Official product names: ImmunoCAP Allergen t3, Common silver birch; ImmunoCAP Allergen t215, Allergen component rBet v 1 PR-10, Birch; ImmunoCAP Allergen t216, Allergen component rBet v2 Profilin, Birch; ImmunoCAP Allergen t220, Allergen component rBet v 4, Birch; ImmunoCAP Allergen t225, Allergen component rBet v 6, Birch; ImmunoCAP Allergen t23, Cypress; ImmunoCAP Allergen t226, Allergen Component Cup a 1, Cypress; ImmunoCAP Allergen t9, Olive; ImmunoCAP Allergen t25, European ash; ImmunoCAP Allergen t224, Allergen Component rOle e 1, Olive; ImmunoCAP Allergen t227, Allergen component nOle e 7 LTP, Olive; ImmunoCAP Allergen t240, Allergen Component rOle e 9, Olive

Spring pollinosis

ImmunoCAP Specific IgE tests

Spring pollinosis is primarily caused by tree pollen. Tree pollen season starts in winter already, typically lasting from January to May. It often overlaps with grass pollen in the late spring and summer, as well as with perennial allergens.

ImmunoCAP Whole Allergens

ImmunoCAP Allergen Components

Birch (t3)

Bet v 1 (t215)
PR-10

Primary sensitiser

- Major allergen
- Likely to cross-react with other PR-10 allergens, e.g. fruits, nuts, vegetables[1–12]
- Indicator for allergen immunotherapy (AIT) suitability

Olive (t9) / **Ash** (t25)

Ole 1 (t224)
Common olive group 1

Primary sensitiser

- Major allergen
- Good marker also for the diagnosis of ash pollen allergy (high cross-reactivity between Fra e 1 and Ole e 1)[4,13–17]

Minor allergens

Bet v 2 (t216)
Profilin

Bet v 4 (t220)
Polcalcin

Bet v 6 (t225)
Isoflavone reductase like

- Cross-reactive allergens
- May not be available in sufficient amounts in AIT extracts[1,3–12]
- Sensitisation to cross-reactive minor allergens only – not suitable for AIT[1,3–12]

Ole e 7 (t227)
LTP

Ole e 9 (t240)
1,3-beta-glucanase

Specific to olive, associated with a more severe phenotype in areas with heavy olive pollen exposure[1,14–17]

Whole extract Birch	Primary sensitiser Bet v 1	Cross-reactive allergens Bet v 2# / Bet v 4# / Bet v 6	Interpreting results*	Management considerations
+/−	+	+/−	• Primary birch sensitisation is likely • Likely cross-reaction with other PR-10 allergens, e.g., in fruits, nuts, vegetables[1–12]	• Consider prescription of AIT • Birch pollen exposure reduction • Consider targeted antihistamines around birch season • Consider assessing risk of reaction to fruits, nuts and vegetables[1–12]
+/−	−	+	• Sensitisation to cross-reactive minor allergens[1,3–12] • The primary allergen source should be identifed[4]	• Not suitable for AIT • Consider further investigations to identify the primary allergen • Consider targeted antihistamines around birch season[1,3–12]
+	−	−	If all components of the algorithm are negative and t3 is positive, the patient could be sensitised to an untested allergen. As such, in the context of clinical history, exposure reduction may still be recommended.[4]	

* Results should always be interpreted in the context of the clinical history. # Profilin (Bet v 2, Phl p 12) and polcalcin (Bet v 4, Phl p 7) from birch and Timothy grass can be used as marker for almost all pollen due to structural similarity.[18]

Allergen immunotherapy

The success of AIT depends largely on whether a patient is sensitised to major allergens such as Bet v 1.[1–12]

Pollen food allergy syndrome

Proteins structurally related to the major birch allergen (Bet v 1) are found in trees of Fagales order, fruits, nuts, and vegetables. Sensitisation to tree pollen can lead to allergic symptoms of the lips and mouth (swelling, redness, tingling) when eating raw fruits, nuts, and vegetables.[17]

Whole extracts Olive / Ash	**Primary sensitiser** Ole e 1	**Cross-reactive allergens** Ole e 7 / Ole e 9	**Interpreting results***	**Management considerations** 
+/−	+	+/−	Primary olive/ash allergy is likely[4,13–17]	• Consider prescription of AIT • Tree pollen exposure reduction[4,13–17]
+/−	−	+	Sensitisation to minor allergens associated with a more severe respiratory phenotype in areas with heavy olive pollen exposure[1,14–17]	• Not suitable for AIT (the allergen composition of olive pollen extracts for AIT may vary significantly, especially with respect to Ole e 7 and Ole e 9[1]) • Olive exposure reduction[1,14–17]
+	−	−	If all components of the algorithm are negative and t9 or t25 is positive, the patient could be sensitised to an untested allergen. As such, in the context of clinical history, exposure reduction may still be recommended.[4]	

* Results should always be interpreted in the context of the clinical history.

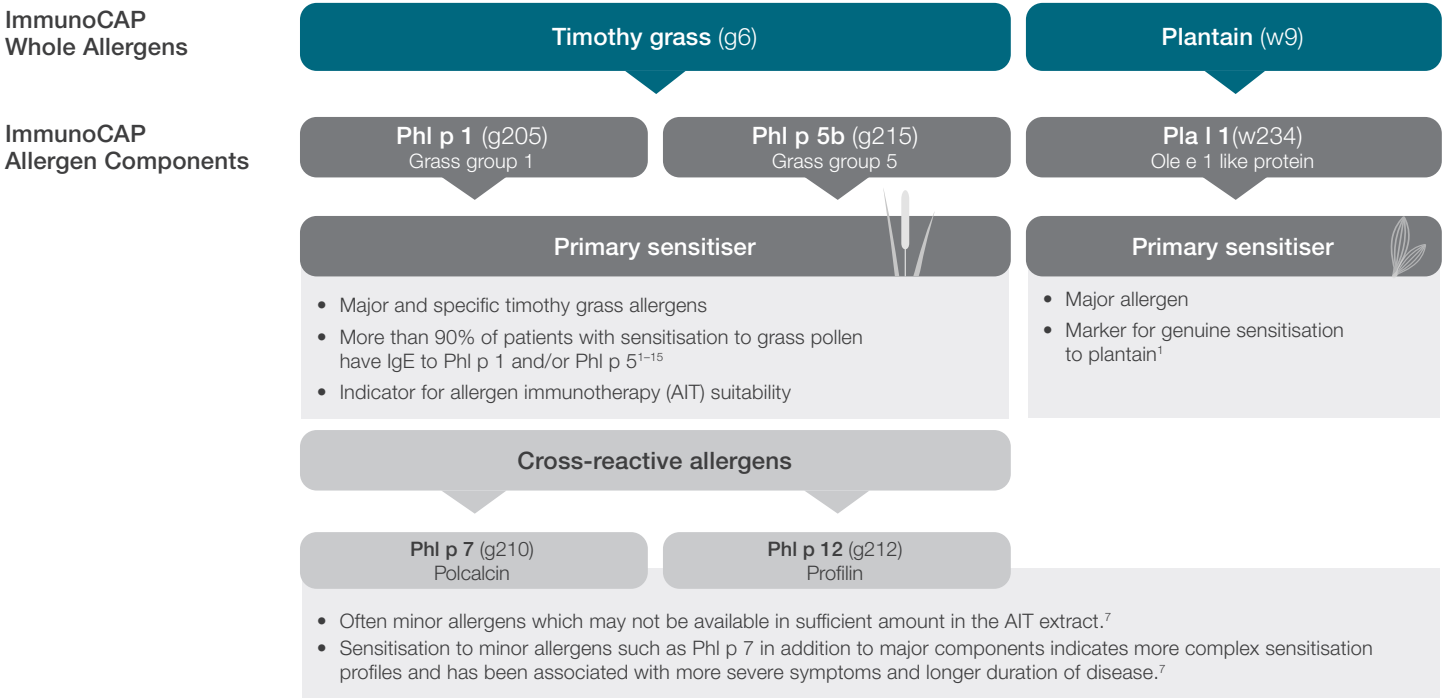
References: 1. Barber D, et al. Allergy 2008;63(11):1550–1558. **2.** Andersson K, et al. International Archives of Allergy & Immunology 2003;130(2): 87–107. **3.** Hatzler L, et al. J Allergy Clin Immunol 2012;130(4):894–901 e5. **4.** Dramburg S, et al. Pediatr Allergy Immunol 2023;34(Suppl 28):e13854. **5.** Sekerkova A, et al. Allergol Int 2012;61(2):339–346. **6.** Tripodi S, et al. J Allergy Clin Immunol 2012;129(3): 834–839 e8. **7.** Cipriani F, et al. Allergy 2017. **8.** Hauser M et al. Allergy Asthma Clin Immunol 2010;6(1):1. **9.** Schmid-Grendelmeier P. Der Hautarzt 2010;61(11):946-953. **10.** Focke M, et al. Clin Exp Allergy 2008;38(8):1400–1408. **11.** Walker SM, et al. Clin Exp Allergy 2011;41(9): 1177– 1200. **12.** Valenta R, et al. J Investig Allergol Clin Immunol 2007;17 Suppl 1:36–40. **13.** Gadermaier G, et al. Methods 2014;66;55-66. **14.** Asero R, et al. Ann Allergy Asthma Immunol 2014;113:307-313. **15.** Santos AF, et al. Allergy 2019. **16.** Alonso, et al. J Investig Allergol Clin Immunol 2023. **17.** Manzanares, et al. Front. Allergy 2023. **18.** Akdis CA, Agache I (Eds.). Global atlas of allergy 2014.

Official product names: ImmunoCAP Allergen t3, Common silver birch; ImmunoCAP Allergen t215, Allergen component rBet v 1 PR-10, Birch; ImmunoCAP Allergen t216, Allergen component rBet v2 Profilin, Birch; ImmunoCAP Allergen t220, Allergen component rBet v 4, Birch; ImmunoCAP Allergen t225, Allergen component rBet v 6, Birch; ImmunoCAP Allergen t9, Olive; ImmunoCAP Allergen t25, European ash; ImmunoCAP Allergen t224, Allergen Component rOle e 1, Olive; ImmunoCAP Allergen t227, Allergen component nOle e 7 LTP, Olive; ImmunoCAP Allergen t240, Allergen Component rOle e 9, Olive

Early summer pollinosis

ImmunoCAP Specific IgE tests

Grass pollen cause allergy symptoms in late spring and summer, typically from May to August, but can sometimes be found year-round in warmer climates. Grass pollen season overlaps with weed pollen, such as plantain, in most parts of Europe, but also with tree pollen in southern Europe.[1]



Whole extract Timothy grass / Plantain	Primary sensitisers Phl p 1 / Phl p 5b	Cross-reactive allergens Phl p 7# / Phl p 12#	Primary sensitiser Pla l 1	Interpreting results*	Management considerations
+/−	+	+/−	−	• Primary timothy grass sensitisation is likely • Sensitisation to Phl p 1 usually precedes other grass pollen component sensitisation in the development of rhinitis symptoms[1–15]	• Consider prescription of AIT • Grass pollen exposure reduction • Targeted antihistamines around Timothy grass pollen season[1–15]
+/−	−	+/−	+	• Primary sensitisation to plantain is likely[1]	• Consider prescription of AIT • Weed pollen exposure reduction • Targeted antihistamines around plantain pollen season[1]
+/−	−	+	−	• Sensitisation to cross-reactive minor allergens[7–15] • Primary sensitiser should be identified	• Consider further investigations to identify the primary allergen • Grass pollen exposure reduction • Consider targeted antihistamines around grass pollen season[7–15]
+	−	−	−	If all components of the algorithm are negative and g6/w9 is positive, the patient could be sensitised to an untested allergen. As such, in the context of clinical history, exposure reduction may still be recommended.[1]	

* Results should always be interpreted in the context of the clinical history. # Profilin (Bet v 2, Phl p 12) and polcalcin (Bet v 4, Phl p 7) from birch and Timothy grass can be used as marker for almost all pollen due to structural similarity.[16]

References: 1. Dramburg S, et al. Pediatr Allergy Immunol 2023;34(Suppl 28):e13854. **2.** Barber D, et al. Allergy 2008;63(11):1550–1558. **3.** Fuertes E, et al. J Allergy Clin Immunol 2023. **4.** Barreto, et al. Front. Allergy, Sec. Allergy Diagnosis 2023. **5.** Sekerkova A, et al. Allergol Int 2012;61(2):339–346. **6.** Tripodi S, et al. J Allergy Clin Immunol 2012;129(3): 834–839 e8. **7.** Cipriani F, et al. Allergy 2017. **8.** Hauser M, et al. Allergy Asthma Clin Immunol 2010;6(1):1. **9.** Schmid-Grendelmeier P. Der Hautarzt 2010;61(11):946-953. **10.** Focke M, et al. Clin Exp Allergy 2008;38(8):1400–1408. **11.** Almeida, at al. Allergologia et Immunopathologia 2019; Volume 47, Issue 6 **12.** Valenta R, et al. J Investig Allergol Clin Immunol 2007;17 Suppl 1:36–40. **13.** Canonica GW,, et al. World Allergy Organization Journal 2013;6(1):17 **14.** Asero R, et al. Eur Ann Allergy Clin Immunol 2012;44(5):183-187. **15.** Kleine-Tebbe J and Jakob T. Springer International Publishing Switzerland 2017. **16.** Akdis CA, Agache I (Eds.) Global atlas of allergy 2014.

Official product names: ImmunoCAP Allergen g6, Timothy grass; ImmunoCAP Allergen g205, Allergen component rPhl p 1, Timothy; ImmunoCAP Allergen g215, Allergen component rPhl p 5b, Timothy; ImmunoCAP Allergen g210, Allergen component rPhl p 7 Polcalin, Timothy; ImmunoCAP Allergen g212, Allergen component rPhl p 12 Profilin, Timothy; ImmunoCAP Allergen w9, Plantain; ImmunoCAP Allergen w234, Allergen component rPla l 1, Plantain

Late summer pollinosis

ImmunoCAP Specific IgE tests

Late summer pollinosis is primarily caused by weed pollen. Weeds flowering season typically lasts from June to September and often overlaps with grass and tree pollen seasons, as well as with perennial allergens.

ImmunoCAP Whole Allergens	**Mugwort** (w6)	**Ragweed** (w1)	**Wall pellitory** (w21)
ImmunoCAP Allergen Components	**Art v 1** (w231) Defensine like-protein	**Amb a 1** (w230) Pectate lyase	**Par j 2** (w211) LTP
	Primary sensitiser	**Primary sensitiser**	**Primary sensitiser**
	• Major allergen for mugwort • Responsible for cross-reactivity with ragweed, sunflower and chamomile[1–14]	• Major allergen for ragweed • Cross-reactivity with pectate lyases from the Asterales order and with the unrelated major grass allergen Phl p 4[1,15]	• Major allergen for wall pellitory • Par j 2 lacks cross-reactivity with LTPs from other species[18]

Cross-reactive allergens[#]

Art v 3 (w233) LTP – Profilin (Bet v 2, Phl p 12) – Polcalcin (Bet v 4, Phl p 7

Art v 3 shares clinically relevant cross-reactivity with other pollen and food LTPs such as Pru p 3 and is considered as an allergen associated to LTP syndrome.[16,19]

Whole extracts Mugwort / Ragweed / Wall pellitory	Primary sensitiser Art v 1	Cross-reactive allergens Art v 3 / Profilin# / Polcalcin#	Primary sensitiser Amb a 1	Primary sensitiser Par j 2	Interpreting results*	Management considerations
+/−	+	−	−	−	Primary sensitisation to mugwort is likely[1–13]	• Consider prescription of allergen immunotherapy (AIT) with mugwort pollen • Weed pollen exposure reduction[1–13]
+/−	+	+/−	−	−	• Sensitisation to mugwort and cross-reactive components • LTP syndrome likely (if Art v 3 positive)[16,19]	• Patient well to moderately suitable for AIT with mugwort • Weed pollen exposure reduction[1–13]
+/−	−	+/−	+	−	Primary sensitisation to ragweed is likely[1–13]	• Consider prescription of AIT with ragweed pollen • Weed pollen exposure reduction[1–13]
+/−	−	+/−	−	+	Primary sensitisation to wall pellitory is likely[1,18]	• Consider prescription of AIT with wall pellitory pollen • Weed pollen exposure reduction[1,18]
+	−	−	−	−	If all components of the algorithm are negative and w1, w6 or w21 is positive, the patient could be sensitised to an untested allergen. As such, in the context of clinical history, exposure reduction may still be recommended.[1]	
+/−	−	+	−	−	• Sensitisation to cross-reactive minor allergens[7–15] • Primary sensitiser should be identified	• Consider further investigations to identify the primary allergen • Weed pollen exposure reduction[1–13]

* Results should always be interpreted in the context of the clinical history. # Profilin (Bet v 2, Phl p 12) and polcalcin (Bet v 4, Phl p 7) from birch and Timothy grass can be used as marker for almost all pollen due to structural similarity.[18]

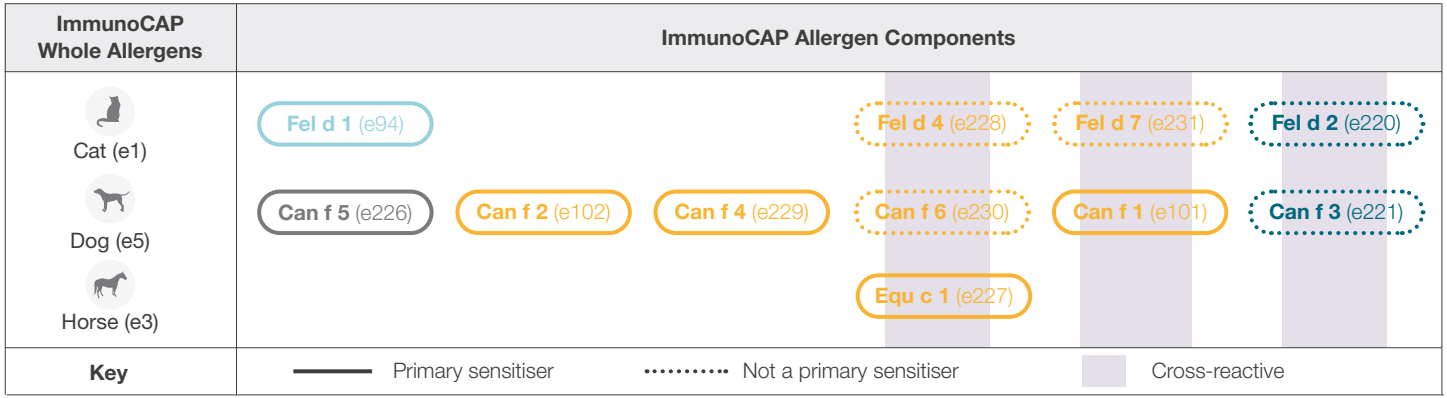
References: 1. Dramburg S, et al. Pediatr Allergy Immunol 2023;34(Suppl 28):e13854. **2.** Gadermaier G, et al. Methods 2014;66;55-66. **3.** Forkel, et al. Int Arch Allergy Immunol 2020;181(2):128-135. **4.** Asero R, et al. Ann Allergy Asthma Immunol 2014; 113:307-313. **5.** Liao, et al. Front. Peridatr. 2022;10:816354. **6.** Cosi V, et al. Curr Allergy Asthma Rep. 2023;23(6):277-285. **7.** Egger M, et al. Allergy 2006;61:461-476. **8.** Gao Z, et al. Allergy 2019;74(2):284-293 **9.** Zbîrcea LE, et al. Int J Mol Sci. 2023;24(4):4040. **10.** Schmid-Grendelmeier, P. Hautarzt 2010;61(11):946-953. **11.** Canonica GW, et al. World Allergy Organization Journal 2013;6(1):17.7. **12.** Asero, R. Eur Ann Allergy Clin Immunol 2012;44(5):183-187 **13.** Kleine-Tebbe, J. and Jakob, T. Editors: Molecular Allergy Diagnostics. Springer International Publishing Switzerland 2017. **14.** Leonard R, et al. J Biol Chem 2010;285(35):27192-200. **15.** Pichler U, et al. PLoS One. 2015;10(5):e0120038. **16.** Wopfner N, et al. Int Arch Allergy Immunol 2005;138(4):337-346. **17.** Zhao L, et al. Clin Transl Allergy 2020;10(1): p. 50. **18.** Asero R, et al. Clin exp Allergy 2018;48(1):6-12. **19.** Scheurer S, et al. 2021;21(2):7.

Official product names: ImmunoCAP Allergen w1, Common ragweed; ImmunoCAP Allergen w6, Mugwort; ImmunoCAP Allergen w21, Wall pellitory; ImmunoCAP Allergen w230, Allergen component nArnb a 1, Ragweed; ImmunoCAP Allergen w231, Allergen component nArt v 1, Mugwort; ImmunoCAP Allergen w233, Allergen component nArt v 3 LTP, Mugwort; ImmunoCAP Allergen w211, Allergen component rPar j 2 LTP, Wall pellitory

Pet allergy

ImmunoCAP Specific IgE tests

Allergen component characteristics and cross-reactivity[1]



Protein family characteristics[1,2]

Uteroglobin/Secretoglobin

- Major cat allergen
- A cat-specific sensitisation marker
- Produced in sebaceous and salivary glands, present in fur and dander

Prostatic Kallikrein

- Major dog allergen
- Produced in prostate gland, present in male dog urine, hair and dander

Lipocalins

- Most are major allergens
- Produced in salivary glands, present in saliva and dander

Serum albumins

- Highly cross-reactive
- Considered minor allergens
- Abundant in saliva and dander

Whole allergen extracts can contain several allergen components.
A positive whole allergen result in combination with negative allergen component results can have several reasons. For example, the patient can be sensitised against a component not yet available for testing. Consider the patient's history, cross-reactivity, and referral to a specialist.[1]

Management considerations

- **Elevated Fel d 1:**
  Introduce targeted exposure reduction to cat and consider allergen immunotherapy (AIT) with a specialist.[3,4]
- **Elevated Can f 1 and/or Can f 2 and/or Can f 4:**
  Introduce targeted exposure reduction to dog and consider AIT with a specialist.[1,3,5,6]
- **Elevated Can f 5 monosensitisation (up to 30%):**[2]
  May tolerate female dogs.[1,3] Consider AIT with specialist.[5]
- **Can f 3/Fel d 2 sensitisation indicates cross-reactivity** and is seldom of clinical importance.[1] However, Fel d 2 can be a primary sensitiser in pork-cat syndrome.[7]
- **Elevated Equ c 1:** Introduce targeted exposure reduction to horse and consider AIT with a specialist.[8]

Disease severity

The risk for and severity of respiratory diseases increase with the number of pet allergen components the patient is sensitised to.

- Sensitisation to ≥ 3 pet allergen components is more common in severe asthma.[3,9,10]
- The higher the specific IgE levels of Fel d 1/Fel d 4/Can f 1/ Can f 2/Can f 5, the higher the risk for asthma.[11–13]
- Co-sensitisation to Fel d 1 and Fel d 4 is associated with asthma symptoms.[12]
- Co-sensitisation to Can f 1, Can f 2, and Can f 5 is associated with asthma symptoms.[12]
- Polysensitisation to pet components at age 4 predicts risk for rhinitis, conjunctivitis and asthma at age 16.[14,15]

References: 1. Dramburg S, et al. EAACI Molecular Allergology User 's Guide 2.0. PAI. 2023;34 (28):e13854. **2.** Schoos, Ann-Marie M. et al. Journal of Allergy and Clinical Immunology, 2021 Volume 147, Issue 4, 1164 - 1173. **3.** Özuygur Ermis SS et al. Clin Exp Allergy. (2023) Jan;53(1):88-104. **4.** Bonnet B, et al. Allergy Asthma Clin Immunol. 2018;14:14. **5.** Liccardi G, et al. Hum Vaccin Immunother. 2018;14(6):1438-1441. **6.** Nwaru BI, et al. J Allergy Clin Immunol Pract. (2019) ;7(4):1230-8.e4. **7.** Konradsen JR, et al. J Allergy Clin Immunol. 2015;135:616-25. **8.** Fernandez-Tavora, et al. J Invest Allergol Clin Immunol 2002,12(1):29-33. **9.** Nordlund B, et al. Allergy. 2012;67:661-9. **10.** Konradsen JR, et al. Pediatr Allergy Immunol. 2014;25:187-92. **11.** Patelis A, et al. Clin Exp Allergy. 2016;46:730-40. **12.** Bjerg A, et al. Pediatr Allergy Immunol. 2015;26(6):557-63. **13.** Perzanowski M, et al. J Allergy Clin Immunol 2016;138:1582-90. **14.** Asarnoj A, et al. J Allergy Clin Immunol. 2016;137:813-21. **15.** Schoos AMM, et al. Allergy Clin Immunol 2021. 147(4):1164-1173.

Official product names: ImmunoCAP Allergen e5, Dog Dander; ImmunoCAP Allergen e1, Cat Dander; ImmunoCAP Allergen e3, Horse Dander; ImmunoCAP Allergen e94, Allergen component rFel d 1 Cat; ImmunoCAP Allergen e220, Allergen component rFel d 2 Cat serum albumin; ImmunoCAP Allergen e228, Allergen component rFel d 4, Cat; ImmunoCAP Allergen e231, Allergen component rFel d 7 Cat; ImmunoCAP Allergen e101, Allergen component rCan f 1 Dog; ImmunoCAP Allergen e102, Allergen component rCan f 2 Dog; ImmunoCAP Allergen e221, Allergen component nCan f 3 Dog serum albumin; ImmunoCAP Allergen e229, Allergen component rCan f 4 Dog; ImmunoCAP Allergen e226, Allergen component rCan f 5 Dog; ImmunoCAP Allergen e230, Allergen component rCan f 6 Dog; ImmunoCAP Allergen e227, Allergen component rEqu c 1, Horse

Note: As in all diagnostic testing, any diagnosis or treatment plan must be made by the clinician based on test results, individual patient history and symptoms, the clinician's knowledge of the patient, as well as their clinical judgement. Patients can be sensitised to more than one allergen component.[1]

Cat allergy

ImmunoCAP Specific IgE tests

More than 200 million people are allergic to cats, which represent one of the most important indoor allergen sources in the world. Cat-sensitised patients suffer from severe respiratory symptoms such as severe chronic rhinitis and asthma.[1,2]

ImmunoCAP Whole Allergen

Cat (e1)

ImmunoCAP Allergen Components

Primary sensitiser – Fel d 1 (e94)
Uteroglobin

- The major cat allergen[3]
- Cat-specific sensitisation marker[3]
- Produced in the salivary glands and skin
- Sensitisation to Fel d 1 during childhood has been shown to be a predictive marker of cat allergy in adolescence[3]
- Indicator for allergen immunotherapy (AIT) suitability[4,5]

Do you know?

The risk and severity of respiratory disease increases with the number of pet allergen components to which the patient is sensitised.

Sensitisation **to ≥ 3 pet allergen components** is more common in severe asthma.[4,7]

Fel d 2 (e220)
Serum albumin

Fel d 4 (e228)
Lipocalin

Fel d 7 (e231)
Lipocalin

Cross-reactive allergens

- Minor allergen
- Present in dander and secretions.[3]
- High cross-reactivity with other serum albumins.[3]
- IgE to Fel d 2 can indicate cross-reactivity and is seldom of clinical importance, however Fel d 2 can be a primary sensitiser in pork-cat syndrome[7]

- Major cat allergen[3]
- Synthesised in salivary glands and dispersed into the environment by saliva and dander.[3]
- Fel d 4 sensitisation is associated with severe asthma symptoms in cat allergic patients with Fel d 1 reactivity[6]
- Sensitisation to Fel d 4 but not Fel d 1 suggests cross-reactivity from other furry animal (e.g. with Can f 6 and Equ c 1 from dog and horse respectively)[3]

- Minor allergen
- Moderate risk of cross-reactivity with Can f 1
- Together with Fel d 1 and Fel d 4, Fel d 7 is the most frequently recognised cat allergens in symptomatic patients, inducing also the maximal basophil activation at low doses[1]

Cat (e1)	Uteroglobin Fel d 1	Lipocalin Fel d 4 / Fel d 7	Serum albumin Fel d 2	Interpreting results*	Management considerations
+/−	+	+/−	+/−	**Primary allergy – suitable for AIT** Primary cat allergy is likely[3,8]	• Cat exposure reduction • Consider AIT, especially if the patient experiences symptoms of asthma with indirect exposure[3,8]
+/−	−	+	+/−	**Cross-reaction with other lipocalins, e.g. dog/horse is likely[3,9]**	• Consider cat exposure reduction • Patients with asthma are at increased risk of severe symptoms • Cross-reactivity with other furry animals is common • Consider further investigations and a wider exposure reduction plan[3,8]
+/−	−	−	+	**Cross-reaction** • Seldom of clinical importance • If mono-sensitised, this is likely a cross-reaction with other serum albumins e.g. dog/horse[3,9-10]	• Consider additional investigations in patients with moderate to high sIgE levels to exclude sensitisation to unboiled milk and raw or medium cooked meat such as sausages, ham and steaks. • Fel d 2 can be a primary sensitiser in pork-cat syndrome[3,7-10]
+	−	−	−	If all components in the algorithm are negative and e1 is positive, the patient might be sensitised to an untested allergen. As such, in the context of clinical history, exposure reduction may still be recommended.[3]	

* Results should always be interpreted in the context of the clinical history.

References: 1. Trifonova D, et al. Int J Mol Sci 2023;24(23):16729. **2.** Asarnoj A, et al. Journal of Allergy and Clinical Immunology 2016;137(3):813-821. **3.** Dramburg S, et al. Pediatr Allergy Immunol 2023;34(Suppl 28):e13854. **4.** Davila I. et al. Allergy. 2018 Jun;73(6):1206-1222) **5.** Bonnet B, et al. Allergy Asthma Clin Immunol. 2018;14:14. **6.** Asarnoj A, et al. J Allergy Clin Immunol 2016;137(3):813-21 **7.** Konradsen JR, et al. J Allergy Clin Immunol. 2015;135:616-25. **8.** Nordlund B, et al. Allergy 2012;67:661-669. **9.** Kleine-Tebbe, J. and Jakob, T. Editors: Molecular Allergy Diagnostics. Springer International Publishing Switwerland 2017. **10.** Posthumous J, et al. J Allergy Clin Immunol 2013;131:924–925.

Official product names: ImmunoCAP Allergen e1, Cat dander; ImmunoCAP Allergen e94, Allergen component rFel d 1 Cat; ImmunoCAP Allergen e220, Allergen component rFel d 2, Cat serumalbumin; ImmunoCAP Allergen e228, Allergen component rFel d 4, Cat; ImmunoCAP Allergen e231, Allergen component rFel d 7, Cat

Dog allergy

ImmunoCAP Specific IgE tests

Allergic sensitisation to dogs is considered a risk factor for asthma and rhinitis and has increased significantly over recent decades for both children and adults. Dog allergen particles are tiny and easily become airborne, disperse effectively, and can enter small bronchioles to reach lower airways.[1]

ImmunoCAP Whole Allergen

Dog (e5)

ImmunoCAP Allergen Components

Can f 1 (e101)
Lipocalin

Can f 2 (e102)
Lipocalin

Can f 4 (e229)
Lipocalin

Can f 5 (e226)
Kallikrein

Primary sensitisers

- Major dog allergen
- Specific marker for primary sensitisation to dog
- Cross-reactivity with other lipocalins, like Fel d 7 (cat)
- Indicator for allergen immuno-therapy (AIT) suitability[1-8]

- Minor allergen
- Marker for primary sensitisation to dog
- Can f 2 sensitisation is associated with severe asthma symptoms[2]
- Indicator for AIT suitability, together with Can f 1[1-8]

- Major dog allergen
- Most abundantly detected allergen in dog fur and a major allergen component of dog hair and dander extracts
- Less suitable for AIT than Can f 1/Can f 2[1-8]

- Major dog allergen
- Can f 5 sensitisation is associated with male dogs.
- Cross-reactivity with prostate-specific antigen of human seminal plasma
- Less suitable for AIT than Can f 1/Can f 2[4,9-12]

Do you know?

Most children sensitised to dog are sensitised to more than one component, and co-sensitisation to Can f 5 and Can f 1 or Can f 2 has shown to be related with asthma.[4]

Can f 3 (e221)
Serum albumin

Can f 6 (e230)
Lipocalin

Cross-reactive allergens

- Minor allergen
- Seldom of clinical importance
- Extensive cross-reactivity and sequence homology with serum albumins from other mammals
- If mono-sensitised, this is likely a cross-reaction with other serum albumins[4,8]

- Major dog allergen
- Can f 6 is significantly associated with dog-related rhinitis and asthma, and can serve as a marker for clinically relevant dog allergy
- Cross-reactive with Equ c 1 (horse) and Fel d 4 (cat), where the highest sIgE level suggest the primary sensitiser[1-8]

Whole extracts	Allergen components	Allergen family	Interpreting results*	Management considerations
Dog dander (e5) 	Can f 1	Lipocalin	Primary sensitisation to dog is likely[1-8]	• Patients with asthma are at increased risk of severe symptoms • Consider dog exposure reduction • Consider AIT prescription • Can f 1 and Can f 2 are indicators for successful AIT[1-8]
	Can f 2			
	Can f 4	Lipocalin	Primary sensitisation to dog is likely[1-8]	• Primary sensitiser • Patients with asthma are at increased risk of severe sympotoms • Consider dog exposure reduction • Can f 4 is cross-reactive with lipocalins from other specias (cat/horse). Further investigation should be considered and perhaps a broader animal avoidance plan[1-8]
	Can f 6	Lipocalin	Primary sensitisation to dog is unlikely[1-8]	• Not a primary sensitiser • Patients with asthma are at increased risk of severe sympotoms • Consider dog exposure reduction • Can f 6 is cross-reactive with lipocalins from other specias (cat/horse). Further investigation should be considered and perhaps a broader animal avoidance plan[1-8]
	Can f 5	Kallikrein	Primary sensitisation to male dog is likely[4,9-12]	• If monosensitised, primary dog allergy to male dogs is likely (30% of patients are monosensitised to Can f 5) • Dog exposure reduction (may be able to tolerate female dogs if monosensitised) • Patients with asthma are at increased risk of severe symptoms • Consider AIT prescription[4,9-12]
	Can f 3	Serum albumin	Cross-reactive, seldom of clinical importance[4,8]	• If monosensitised, this is likely a cross-reaction with other serum albumins • Consider additional investigations in patients with moderate to high sIgE levels to exclude sensitisation to unboiled milk and raw or medium cooked meat such as sausages, ham and steaks[4,8]

* Results should always be interpreted in the context of the clinical history.

References: 1. Nordlund B, et al. Allergy 2012;67:661–9. **2.** Nicholas C, et al. Ann Allergy Asthma Immunol 2010;105:228-33. **3.** Konradsen JR, et al. Allergy Clin Immunol 2015;135:616-25. **4.** Dramburg S, et al. Pediatr Allergy Immunol 2023;34(Suppl 28):e13854. **5.** Canonica GW, et al. World Allergy Organization Journal 2013;6(1):17.7. **6.** Asero, R. Eur Ann Allergy Clin Immunol 2012;44(5):183-7. **7.** Schmid-Grendelmeier, P, et al. Der Hautarzt 2010;61(11):946-953. **8.** Kleine-Tebbe, J. and Jakob, T. Editors: Molecular Allergy Diagnostics. Springer International Publishing Switzerland 2017. **9.** Mattsson L, et.al. J Allergy Clin Immunol 2009;123(2):362-368. **10.** Basagana, M. Allergy Int Arch Allergy Immunol 2012;159:143–146. **11.** Kofler L, et al. Eur Ann Allergy Clin Immunol 2012;44(2):89-92. **12.** Schoos AM, et al. J Allergy Clin Immunol Pract 2017;5(6):1754-1756.

Official product names: ImmunoCAP Allergen e5, Dog dander; ImmunoCAP Allergen e101, Allergen component rCan f 1, Dog; ImmunoCAP Allergen e102, Allergen component rCan f 2, Dog; ImmunoCAP Allergen e221, Allergen component nCan f 3, Dog serum albumin; ImmunoCAP Allergen e229, Allergen component rCan f 4, Dog; ImmunoCAP Allergen e226, Allergen component rCan f 5, Dog; ImmunoCAP Allergen e230, Allergen component rCan f 6, Dog

Horse allergy

ImmunoCAP Specific IgE tests

Horse allergy occurs among people who are in contact with horses regularly, either professionally or for recreational purposes. It can result in the induction or exacerbation of asthma, allergic rhinitis, allergic conjunctivitis and occupational asthma. Horse allergens have the potential to cause severe allergic reaction, but are often overlooked.[1-3]

ImmunoCAP Whole Allergen

Horse (e3)

ImmunoCAP Allergen Components

Equ c 1 (e227)
Lipocalin

Primary sensitiser

- Major and specific horse allergen[4]
- Most prevalent allergen (50% to 76%) among the horse-allergic patients.
- Present in saliva, hair and to some extent, in the urine of horses
- Associated with severe asthma in children and adults and significantly associated with moderate-to-severe rhinitis among horse-sensitised patients[5,6]
- Cross-reactivity with other lipocalins such as Can f 6 (dog) and Fel d 4 (cat)[4]
- Indicator for allergen immunotherapy (AIT) suitability[7]

Equ c 3#
Serum albumin

Cross-reactive allergen

- Minor allergen
- Seldom of clinical importance
- Potential cross-reactivity between serum albumins of different mammalian species[4]

Do you know?

Polysensitisation to several furry animals is common.

Horse holders are frequently exposed to more common airborne allergens (grass, mold, mite). This is important to consider in differential diagnosis.[8]

Available only on ImmunoCAP ISAC$_{E112i}$ test

Horse (e3)	Lipocalin Equ c 1	Serum albumin Equ c 3#	Interpreting results*	Management considerations
+/−	+	+/−	**Primary allergy – suitable for AIT** Primary horse allergy is likely	• Horse exposure reduction[3,4] • Consider AIT[7]
+/−	−	+	**Cross-reaction** • Seldom of clinical importance • If mono-sensitised, this is likely a cross-reaction with other serum albumins from e.g. dog or cat	• Consider additional investigations in patients with moderate to high sIgE levels to exclude sensitisation to unboiled milk and raw or medium cooked meat such as sausages, ham and steaks.
+	−	−	If all components in the algorithm are negative and e3 is positive, the patient might be sensitised to an untested allergen. As such, in the context of clinical history, exposure reduction may still be recommended.[4]	

* Results should always be interpreted in the context of the clinical history. # Available only on ImmunoCAP ISAC$_{E112i}$ test.

References: 1. Gawlik, et al. WAO Journal 2009;2:185–189. **2.** Cosme-Blanco W, et al Pediatr Allergy Immunol 2017;28(6):608-610. **3.** Roberts G and Lack G. Horse allergy in children BMJ 2000;321: 286 –287. **4.** Dramburg S, et al. Pediatr Allergy Immunol 2023;34(Suppl 28):e13854. **5.** Schoos A-MM, et al. Journal of Allergy and Clinical Immunology 2021;147(4):1164-1173. **6.** Nwaru BL, et al. The journal of allergy and clinical immunology in practice 2019;7(4):1230-1238.e4. **7.** Asero, et al. Eur Ann Allergy Clin Immunol 2012;44(5):183-187. **8.** Mańkowska A, Witkowska D. Animals 2024;14, 2062.

Official product names: ImmunoCAP Allergen e3, Horse dander; ImmunoCAP Allergen e227, Allergen component rEqu c 1, Horse

House dust mite allergy

ImmunoCAP Specific IgE tests

House dust mite sensitisation is an important risk factor for rhinitis and asthma.[1] In Europe the most common house dust mites (HDM) are *Dermatophagoides pteronyssinus* and *Dermatophagoides farinae.*[1] **Component-resolved diagnostics can be helpful to improve patient management and support the definition of most appropriate allergen specific immunotherapy (AIT).[1]**

ImmunoCAP Whole Allergens

Dermatophagoides pteronyssinus (d1) **+ *Dermatophagoides farinae*** (d2)

ImmunoCAP Allergen Components#

Der p 1 (d202) / **Der p 2** (d203) / **Der p 23** (d209)

Der p 10 (d205)

Primary sensitiser

Monosensitization can be detected in 3-5% of HDM allergic patients.[1]

Choice of AIT

- Differentiation between Der p 1, 2 and 23 sensitisation helps choose appropriate AIT.[1–5]
- Der p 23 amount in fecal particles/bodies is low and this allergen may therefore be underrepresented in AIT.[6]

Assess risk for asthma

- Early sensitisation to Der p 1, Der p 2 and Der p 23 is associated with asthma development.[7]
- Asthmatic patients are sensitised to more components than those without asthma.[8]

Cross-reactive allergen

Further examination needed

- Tropomyosin, minor allergen, less than 10% sensitisation rate in HDM allergy[1,9]
- Cross-reactivity between HDM, crustaceans, insects and molluscs[1,9]

High cross-reactivity between *D. pteronyssinus* and *D. farinae* allergen components[1]

Management considerations

D. pteronyssinus or *D. farinae*	Der p 1 / Der p 2 / Der p 23	Der p 10	Considerations
+/−	+	+/−	**If clinical symptoms are present with exposure to HDM,** high probability of clinical house dust mite allergy. Consider the following:[1] • HDM exposure reduction • Prescription of AIT and appropriate referrals
+/−	−	+	**Further examination needed:**[1,9] • Possible cross-reactivity • If Der p 10 is dominant, food allergy (e.g., shellfish) should be investigated, history depending
+	−	−	If all components of the algorithm are negative and d1/d2 are positive, the patient could be sensitised to an untested allergen. As such, in the context of clinical history, exposure reduction may still be recommended.[1]

Note: As in all diagnostic testing, any diagnosis or treatment plan must be made by the clinician based on test results, individual patient history and symptoms, the clinician's knowledge of the patient, as well as their clinical judgement. Patients can be sensitised to more than one allergen component.[1]

Whole allergen extracts can contain several allergen components. *A positive whole allergen result in combination with negative allergen component results can have several reasons. For example, the patient can be sensitised against a component not yet available for testing. Consider the patient's history, cross-reactivity, and referral to a specialist.*[1]

References: 1. Dramburg S, et al. Pediatr Allergy Immunol 2023;34(Suppl 28):e13854. **2.** Asero R. Eur Ann Allergy Clin Immunol. 2012;44(5):183-7. **3.** Schmid-Grendelmeier P. Hautarzt. 2010;61(11):946-53. **4.** Thomas WR. Allergology International. 2015;64:304-11. **5.** Canonica GW, et al. Expert Rev Clin Immunol. 2016;12(8):805-15. **6.** Weghofer M, et al. J Immunol. 2013;190(7):3059-67. **7.** Posa D, et al. J Allergy Clin Immunol. 2017;139:541-94. **8.** Resch Y, et al. J Allergy Clin Immunol. 2015;136:1083-91. **9.** Huang H-J, et al. Molecular Immunol. 2023;158:54-67.

Official product names: ImmunoCAP Allergen d1, House dust mite; ImmunoCAP Allergen d2, House dust mite; ImmunoCAP Allergen d202, Allergen component rDer p 1, House dust mite; ImmunoCAP Allergen d203, Allergen component rDer p 2, House dust mite; ImmunoCAP Allergen d209, Allergen component rDer p 23, House dust mite; ImmunoCAP Allergen d205, Allergen component rDer p 10 Tropomyosin, House dust mite

Alternaria alternata

ImmunoCAP Specific IgE tests

Alternaria is a genus of worldwide fungi found in different habitats such as soil, the atmosphere, plants or indoor environments. *Alternaria alternata* is considered one of the most important sources of fungal allergens worldwide and it is associated with severe asthma and respiratory status.[1] Cross-reactivity is linked to the homology between allergens found in *A. alternata* and other allergenic molds, mainly *Cladosporium*, *Penicillium*, and *Aspergillus*. Less frequent cross-reactivity has been reported with foods, like mushrooms and spinach.[2]

ImmunoCAP Whole Allergen

Alternaria alternata (m6)

ImmunoCAP Allergen Components

Alt a 1 (m229) – Acid glycoprotein

Primary sensitiser

- Major allergen and marker of genuine sensitization to *Alternaria alternata*[2]
- Main trigger of respiratory allergy in patients affected by fungal allergy[3]
- A vast majority (80–100%) of *Alternaria* sensitised patients have specific IgE to Alt a 1[4]
- Indicator for allergen immunotherapy (AIT) suitability[3, 5]

Cross-reactive allergen

Alt a 6 (m230)* – Enolase

- Minor allergen
- Alt a 6 sensitization may be associated with cross-reactivity among members of different phyla like food, grass pollen and latex allergens[1, 6]

* Available only on ImmunoCAP ISAC$_{E112i}$ test.

Whole extract *Alternaria alternata*	Primary sensitiser Alt a 1	Cross-reactive allergen Alt a 6#	Interpreting results*	Management considerations
			• Primary allergy to *Alternaria alternata* is probable[2] • Risk marker for severe asthma[3]	• Consider prescription AIT[3] • *Alternaria alternata* exposure reduction[3] • Clinical cross-reactivity can occur without molecular homology, as reported for *A. alternata* and kiwifruit. Alt a 1 interacts with the thaumatin-like protein (PR-5) Act d 2 present in the pulp of kiwifruit and may be responsible for reactions to *A. alternata* caused by kiwifruit ingestion.[7]
			• Marker of cross-reactivity with other fungal allergenic enolases[8]	• The prescription of AIT is contraindicated in patients monosensitised to Alt a 6.[9]
			If all components in the algorithm are negative and m6 is positive, the patient might be sensitised to an untested allergen. As such, in the context of clinical history, exposure reduction may still be recommended.[9]	

* Results should always be interpreted in the context of the clinical history. # Available only on ImmunoCAP ISAC$_{E112i}$ test

References: 1. Sánchez P, et al. Journal of Fungi 9 2022;8(3):277. **2.** Gabriel MF, et al. Environ Int 2016;89-90:71-80. **3.** Rick EM, et al. J Investig Allergol Clin Immunol 2016;26(6):344-354. **4.** Twaroch TE, et al. Clin Exp Allergy 2012;42(6):966-975. **5.** Liu J, et al. Front Immunol 2021. **6.** Čelakovska J, et al. Food and Agricultural Immunology 2019;30(1):1097-111. **7.** Gomez-Casado C, et al. FEBS Letters 2014;588(9):1501-1508. **8.** Moreno A, et al. Allergy Asthma Immunol Res 2016;8(5):428-437. **9.** Dramburg S, et al. Pediatr Allergy Immunol 2023;34(Suppl 28):e13854.

Official product names: ImmunoCAP Allergen m6, Alternaria alternata; ImmunoCAP Allergen m229, Allergen component rAlt a 1, Alternaria alternata

Aspergillus fumigatus

ImmunoCAP Specific IgE tests

Aspergillus fumigatus is a saprotroph and opportunistic filamentous fungus widely distributed all over the world and is the causal agent of allergic and infectious diseases affecting dozens of millions of people globally.[1–3] **Allergic bronchopulmonary aspergillosis** (ABPA) is the most severe *Aspergillus*-related allergic disease, affecting 1-2.5% of asthmatic patients and up to 10% of cystic fibrosis patients during their lifetime.[4] Other significant allergic *Aspergillus*-related diseases are **allergic fungal rhinosinusitis** (AFRS) and **severe asthma with fungal sensitisation** (SAFS).[5]

ImmunoCAP Whole Allergen

Aspergillus fumigatus (m3)

ImmunoCAP Allergen Components

Asp f 1 (m218)
Ribotoxin

Asp f 2 (m219)
unknown

Asp f 4 (m221)
unknown

Primary sensitiser

- Major allergen and marker of genuine sensitization to *Aspergillus fumigatus*[6]
- Not present in spores, produced after germination process[7]
- Significant in asthmatic and ABPA patients[6]

- Major allergen and marker of genuine sensitisation to *Aspergillus fumigatus*[6]
- High levels of sIgE to Asp f 2 are associated with ABPA and inadequate asthma control[8]

- Marker of genuine sensitisation to *Aspergillus fumigatus*[9]
- Specific for ABPA diagnosis[10]

Cross-reactive allergens

Asp f 3 (m220)
Peroxisomal protein

- Displays cross-reactivity with homologues from other fungal species and genera[11]
- High levels of specific IgE to Asp f 3 are associated with ABPA and bronchiectasis[8]

Asp f 6 (m222)
MnSOD (Manganese-dependent superoxide dismutase)

- Asp f 6 cross-reacts with other eukaryotic MnSOD[12]
- Cross-reactivity to Asp f 6 is frequent in atopic dermatitis because of sensitisation to Mala s 11 from *Malassezia Sympodialis*[12]
- Specific for ABPA diagnosis[6]

Whole extract *Aspergillus fumigatus*	Primary sensitisers Asp f 1 / Asp f 2 / Asp f 4	Cross-reactive allergens Asp f 3 / Asp f 6	Interpreting results*	Management considerations
+/−	+	+/−	• Primary allergy to *Aspergillus fumigatus*[6,9]	• Genuine sensitisation to *Aspergillus fumigatus*[6,9] • *Aspergillus fumigatus* exposure reduction
+/−	−	+	• Cross sensitisation from other mould species is likely[11,12]	• Consider further investigations to identify the primary sensitiser[11–13]
+	−	−	If all components in the algorithm are negative and m3 is positive, the patient might be sensitised to an untested allergen. As such, in the context of clinical history, exposure reduction may still be recommended.[15]	

* Results should always be interpreted in the context of the clinical history.

Allergic and infectious diseases caused by *Aspergillus fumigatus*

- ***Aspergillus*-related allergic** (type I hypersensitivity, IgE): Diseases mainly affect asthmatic and cystic patients, although rhino-sinusal forms may develop in otherwise nonaffected subjects
- **Hypersensitivity pneumonitis** (type III hypersensitivity, IgG): Disease that may develop in the context of occupational exposure, for example in farmers and in rural, malt, or stucco workers
- **Allergic bronchopulmonary aspergillosis** (ABPA): Most severe *Aspergillus*-related allergic disease, affecting 1-2.5% of asthmatic patients and up to 10% of cystic fibrosis patients during their lifetime[4]
- **Allergic fungal rhinosinusitis** (AFRS) and **severe asthma with fungal sensitisation** (SAFS): AFRS is a unique form of immune-mediated non-invasive fungal rhinosinusitis; SAFS is another phenotype of severe asthma associated with fungal sensitization in adults having overlapping characteristics with ABPA[5]

References: 1. Dellière S, et al. Mycopathologia 2023;188, 603–621. **2.** Bongomin F, et al. Journal of fungi 2017;3(4):57. **3.** Rhodes JC. 2006;44(Suppl 1):S77-81. **4.** Patel G, et al. Allergy and Asthma Proceedings 2019;40(6):421-424. **5.** Wiesmuller GA, et al. Allergo J Int 2017;26(5):168-193. **6.** Carsin A, et al. Allergy 2017;72(11):1632-1642. **7.** De Linares C, et al. J. Fungi 2023. **8.** Muthu V, et al. Clin Exp Allergy 2018. **9.** Fukutomi Y, et al. Official journal of the Japanese Society of Allergology 2016. **10.** Luo W, et al. J Clin Lab Anal 2020. **11.** Hillmann F, et al. Sci Rep 2016. **12.** Crameri, R. Clin Exp Allergy 2012. **13.** Bowyer P, et al. Medical Mycology 2006. **14.** Patterson TF, et al. Clinical Infectious Diseases 2016. **15.** Dramburg S, et al. Pediatr Allergy Immunol 2023;34(Suppl 28):e13854.

Official product names: ImmunoCAP Allergen m3, Aspergillus fumigatus; ImmunoCAP Allergen m218, Allergen component rAsp f 1 Aspergillus fumigatus; ImmunoCAP Allergen m219, Allergen component rAsp f 2 Aspergillus fumigatus; ImmunoCAP Allergen m220, Allergen component rAsp f 3 Aspergillus fumigatus; ImmunoCAP Allergen m221, Allergen component rAsp f 4 Aspergillus fumigatus; ImmunoCAP Allergen m222, Allergen component rAsp f 6 Aspergillus fumigatus

Asthma and allergy

ImmunoCAP Specific IgE tests

Specific IgE testing can support in getting the diagnosis right the first time for patients with allergic rhinitis symptoms, which can be connected to asthma.[1]

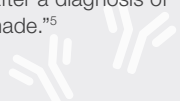
Indication

Evaluation of suspected allergy in perennial/ seasonal asthma/ rhinitis

Global asthma guidelines[2–8]

Global and country-specific guidelines recommend testing patients with symptoms of or diagnosis of asthma for allergen sensitization.[2–8]

For example: "NICE guidelines recommends testing for aeroallergens to identify triggers after a diagnosis of asthma has been made."[5]



Common perennial/seasonal allergens in asthma[9–14]

Pollen allergens (regional specific)

- **Timothy grass** (g6)
- **Common silver birch** (t3)
- **Common ragweed** (w1)
- **Mugwort** (w6)
- **Olive** (t9)

Perennial allergens

- **House dust mite** (d1)
- **Cat dander** (e1)
- **Dog dander** (e5)
- **Mould mix** (mx1)

References: 1. Demoly P, et al. J. Asthma Allerg. 2022:15 1069–1080. **2.** Casale TB, et al. J Allergy Clin Immunol Pract. 2020;8(8):2526-2532. **3.** NAEPPCC. 020 Focused Updates to the Asthma Management Guidelines: A Report. J Allergy Clin Immunol 2020;146(6):1217-1270. **4.** Nationale VersorgungsLeitlinien (NVL). NVL Asthma 4th edition. Available from: https://www.leitlinien.de/themen/asthma/4-auflage/kapitel-2; last accessed December 2022. **5.** National Institute for Health and Care Excellence (NICE). Asthma: diagnosis, monitoring and chronic asthma management (NG80). https://www.nice.org.uk/guidance/ng80; last accessed December 2022. **6.** Global Strategy for Asthma Management and Prevention (GINA) 2022. Available from: https://ginasthma.org/wp-content/uploads/2022/07/GINA-Main-Report-2022-FINAL-22-07-01-WMS.pdf; last accessed December 2022. **7.** Raherison-Semjen C, et al. Update of the 2021 recommendations for the management and follow-up of adult asthmatic patients under the guidance of the French Society of Pulmonology and the Paediatric Society of Pulmonology and Allergology. Revue des Maladies Respiratoires. 2021;38:1048-1083. **8.** Chabane H, et al. Recommendations for the prescription and interpretation of laboratory tests that can be used in the diagnosis or monitoring of allergies, available in France. Part 1: preamble. Revue française d'allergologie. 2021;61:459-478. **9.** Burbach G J, et al. GA2LEN skin test study II. Allergy. 2009;64(10):1507-15. **10.** Ciprandi G, et al. The POLISMAIL study. Eur Ann Allergy Clin Immunol 2008;40(3):77-83. **11.** Bousquet J, et al. In collaboration with the World Health Organization, J Allergy Clin Immunol 2001;108(5):S147-S334. **12.** Wickman M. Allergy. 2005;60(s79):14-8. **13.** Allen-Ramey F, et al. J Am Board Fam Med (Online). 2005;18(5):434-9. **14.** Høst A, et al. Allergy 2000;55(7):600-8. **15.** Schreiber J, et al. J Allergy Clin Immunol 2019;143(6):2279-2280.e2. **16.** Schreiber J, et al. Congress Abstract V529 at DGP 2019. Pneumologie 2019;73(S 01). Georg Thieme Verlag KG Stuttgart · New York. DOI: 10.1055/s-0039-1678315. **17.** Lücke E, et al. J Asthma 2023. DOI: 10.1080/02770903.2023.2213327.

Severe asthma and allergen sensitisation

ImmunoCAP Specific IgE tests

Indication

Evaluation of suspected allergy in severe, persistent asthma (GINA Step IV)[9]

Note: As in all diagnostic testing, any diagnosis or treatment plan must be made by the clinician based on test results, individual patient history and symptoms, the clinician's knowledge of the patient, as well as their clinical judgement. Patients can be sensitised to more than one allergen component.[1]

1st Allergen test profile for severe asthma[15–17]

- ***D. pteronyssinus*** (d1)
- ***D. farinae*** (d2)
- **Cat dander** (e1)
- **Dog dander** (e5)
- ***Aspergillus fumigatus*** (m3)
- ***Candida albicans*** (m5)
- **Staphylococcal enterotoxin B** (m81)
- **Moth,** *Bombyx mori* (i8)

Sensitivity 94%[16]

If 1st test profile is negative, test 2nd allergen profile.

2nd Allergen test profile for severe asthma[15–17]

- **Horse dander** (e3)
- **German Cockroach,** *Blatella germanica* (i6)
- ***Alternaria alternata*** (m6)
- **Staphylococcal enterotoxin A** (m80)
- **Storage mite,** *Acarus siro* (d70)
- **Storage mite,** *Blomia tropicalis* (d201)
- **Storage mite,** *Euroglyphus maynei* (d74)
- **Storage mite,** *Tyrophagus putrescentiae* (d72)

Sensitivity 99%[16]
(combined with 1st profile)

Official product names: ImmunoCAP Allergen d1, House dust mite; ImmunoCAP Allergen d2, House dust mite; ImmunoCAP Allergen d70, Storage mite; ImmunoCAP Allergen d72, Storage mite; ImmunoCAP Allergen d74, House dust mite; ImmunoCAP Allergen d201, House dust mite; ImmunoCAP Allergen e1, Cat dander; ImmunoCAP Allergen e3, Horse dander; ImmunoCAP Allergen e5, Dog dander; ImmunoCAP Allergen g6, Timothy; ImmunoCAP Allergen i6, Cockroach, German; ImmunoCAP Allergen i8, Moth; ImmunoCAP Allergen m3, Aspergillus fumigatus; ImmunoCAP Allergen m5, Candida albicans; ImmunoCAP Allergen m6, Alternaria alternata; ImmunoCAP Allergen m80, Staphylococcal enterotoxin A; ImmunoCAP Allergen m81, Staphylococcal enterotoxin B; ImmunoCAP Allergen mx1, Moulds; ImmunoCAP Allergen t3, Common silver birch; ImmunoCAP Allergen w1, Common ragweed; ImmunoCAP Allergen w6, Mugwort; ImmunoCAP Allergen t9 Olive.

Asthma and allergy

ImmunoCAP Specific IgE tests

Integrating aeroallergen evaluation into asthma management is of paramount importance to optimise the asthma patient journey from diagnosis to treatment.[1]

Diagnosis includes assessment of allergen sensitisation[1]

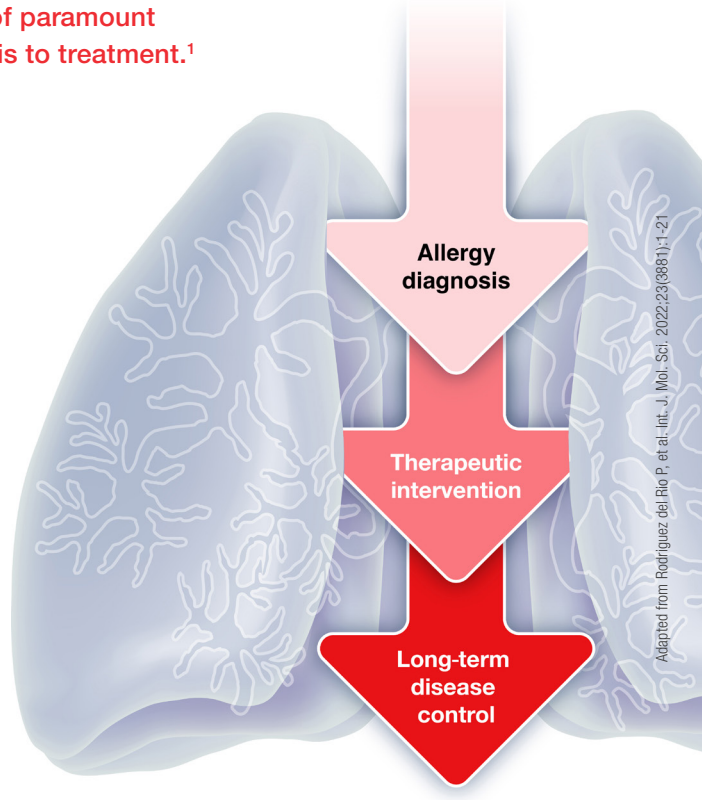
- Qualifies a T2 inflammatory response to allergic sensitisation[2]
- Gives a more precise clinical picture of asthma phenotype and endotype[3]
- Identifies two or more co-existing sensitisations (polysensitisation) that could contribute to asthma symptoms, cross-reactive allergens, minor allergens[4–6]

Enables therapeutic intervention[1]

- Flags up which allergens should be avoided[7–9]
- Helps to justify treatment selection, especially when decreasing or increasing corticosteriod use[10,11]
- Essential for careful administration of allergen immunotherapies (AITs), such as sublingual immunotherapy (SLIT) or subcutaneous immunotherapy (SCIT)[12–14]

Support long-term allergic asthma management[1]

- Contributes to understanding if symptoms of asthma will resolve, continue to develop, or change over time[12,15,16]
- Can predict an increasing risk of exacerbation[17]



Adapted from Rodriguez del Rio P, et al. Int. J. Mol. Sci. 2022;23(3881):1-21

Testing with aeroallergen components can help to identify individuals sensitised to species-specific or to cross-reactive allergens, as well as to confirm polysensitisation.[1,18]

Allergen source	ImmunoCAP™ Whole Allergen*	ImmunoCAP™ Allergen Component* Primary sensitiser[13,14]
Pollen	Birch (t3)	Bet v 1 (t215)
	Ash (t25) / olive (t9)	Ole e 1 (t224)
	Timothy gras (g6)	Phl p 1 (g205) / Phl p 5b (g215)
	Mugwort (w6)	Art v 1 (w231)
	Ragweed (w1)	Amb a 1 (w230)
	Plantain (w9)	Pla l 1 (w234)
Mite	*Dermatophagoides pteronyssinus* (d1)#	Der p 1 (d202) / Der p 2 (d203) / Der p 23 (d209)
Animals	Cat (e1)	Fel d 1 (e94)
	Dog (e5)	Can f 1 (e101) / Can f 2 (e102) / Can f 4 (e229) / Can f 5 (e226)
	Horse (e3)	Equ c 1 (d227)
Mould	*Alternaria alternata* (m6)	Alt a 1 (m229)
Panallergen##	Profiline, e.g. Bet v 2 (t216), Phl p 12 (g212)	
	Polcalcine, e.g. Bet v 4 (t220), Phl p 7 (g210)	

Table: Most common whole allergens and corresponding allergen components[13,14]

Official product names: ImmunoCAP Allergen t3, Common silver birch; ImmunoCAP Allergen t215, Allergen component rBet v 1, PR-10, Birch; ImmunoCAP Allergen t25, European ash; ImmunoCAP Allergen t9, Olive; ImmunoCAP Allergen t224, Allergen component rOle e 1, Olive; ImmunoCAP Allergen g6, Timothy; ImmunoCAP Allergen g205, Allergen component rPhl p 1, Timothy; ImmunoCAP Allergen g215, Allergen component rPhl p 5b, Timothy; ImmunoCAP Allergen w6, Mugwort; ImmunoCAP Allergen w231, Allergen component nArt v 1, Mugwort; ImmunoCAP Allergen w1, Ragweed; ImmunoCAP Allergen w230, Allergen component nAmb a 1, Ragweed; ImmunoCAP Allergen w9, Plantain; ImmunoCAP Allergen w234, Allergen component rPla l 1, Plantain; ImmunoCAP Allergen d1, House dust mite; ImmunoCAP Allergen d2, House dust mite; ImmunoCAP Allergen d202, Allergen component rDer p 1, House dust mite; ImmunoCAP Allergen d203, Allergen component rDer p 2, House dust mite; ImmunoCAP Allergen d209, Allergen component rDer p 23, House dust mite; ImmunoCAP Allergen d205, Allergen component rDer p 10 Tropomyosin, House dust mite; ImmunoCAP Allergen e94, Allergen component rFel d 1 Cat; ImmunoCAP Allergen e220, Allergen component rFel d 2 Cat serum albumin; ImmunoCAP Allergen e228, Allergen component rFel d 4, Cat; ImmunoCAP Allergen e231, Allergen component rFel d 7 Cat; ImmunoCAP Allergen e101, Allergen component rCan f 1 Dog; ImmunoCAP Allergen e102, Allergen component rCan f 2 Dog; ImmunoCAP Allergen e221, Aller-gen component nCan f 3 Dog serum albumin; ImmunoCAP Allergen e229, Allergen component rCan f 4 Dog; ImmunoCAP Allergen e226, Allergen component rCan f 5 Dog; ImmunoCAP Allergen e230, Allergen component rCan f 6 Dog; ImmunoCAP Allergen e227, Allergen component rEqu c 1, Horse; ImmunoCAP Allergen m6, Alternaria alternata; ImmunoCAP Allergen m229, Allergen component rAlt a 1, Alternaria alternata; ImmunoCAP Allergen t216, Allergen component rBet v 2 Profilin, Birch; ImmunoCAP Allergen t220, Allergen component rBet v 4, Birch; ImmunoCAP Allergen g210, Allergen component rPhl p 7, Timothy; ImmunoCAP Allergen g212, Allergen component rPhl p 12 Profilin, Timothy.

High cross-reactivity between *D. pteronyssinus* and *D. farinae* allergen components[14] ## Pollen components that help to explain multiple positive skin prick tests or specific IgE tests, but should not be considered an indication for AIT[13,14]

Note: As in all diagnostic testing, any diagnosis or treatment plan must be made by the clinician based on test results, individual patient history and symptoms, the clinician's knowledge of the patient, as well as their clinical judgement. Patients can be sensitised to more than one allergen component.[18]

References: 1. Rodriguez del Rio P, et al. Int. J. Mol. Sci. 2022, 23, 3881. **2.** Cremades-Jimeno L, et al. Front Immunol. 2021;12:640791. **3.** Licari A, et al. Pediatr Pulmonol. 2020;55:1894–96. **4.** Tabar AI, et al. Int Arch Allergy Immunol. 2021;182:496-514. **5.** Burrows B, et al. Am J Respir Crit Care Med. 1995;152(Pt 1):1497-00. **6.** Gerald JK, et al. J Allergy Clin Immunol Pract. 2015;3:540-46.e3. **7.** Cipriani F, et al. Front Pediatr. 2017;5:103. **8.** Fitzpatrick AM, et al. JACI Pract. 2019;7:915-24.e7. **9.** Marcon A, et al. J Allergy Clin Immunol Pract. 2020;8:980-88. **10.** Casale TB, et al. J Allergy Clin Immunol Pract. 2020;8:2526-32. **11.** Tiotiu A, et al. J Asthma. 2021;1-16. **12**. Agache I, et al. Mol Aspects Med. 2022;85:101027. **13.** Barber D, et al. Allergy. 2021;76:3642-58. **14.** Pfaar O, et al. Guideline on AIT in IgE-mediated allergic diseases. Allergol Select. 2022; 6: 167-232. **15.** Chiu CJ, Huang MT. Int J Mol Sci. 2021;22:4528. **16.** Sastre-Ibañez M, Sastre J. Expert Rev Mol Diagn. 2015;15:789-99. **17.** Ansotegui IJ, et al. A WAO-ARIA-GA2LEN consensus document on molecular-based allergy diagnosis (PAMD@): Update 2020. WAO J. 2020;13:100091. **18.** Demoly P, et al. Journal of Asthma and Allergy 2022:15 1069-1080

Perennial / seasonal allergic asthma

ImmunoCAP Specific IgE tests

Specific IgE blood testing helps to identify allergic triggers, and to confirm suspected allergies in asthmatic patients.[1,2]

Who to test[2]

- **Persistent asthmatics**
- **Preschool children with repeated wheeze**

Patients needing[2]
- oral corticosteroids
- high-dose inhaled corticosteroids

Patients seeking to[2]
- understand their disease better
- get guidance on pets

Candidates for[2]
- allergen-specific immunotherapy
- biologicals

Why to test

Allergens are a major trigger in asthma.[3,4]

Up to **90%** of children and **60%** of adults with asthma are sensitised to at least one specific allergen.[3,4]

What to test

Global asthma guidelines recommend specific IgE testing after asthma diagnosis is confirmed.[5–13]

Specific IgE testing can assess whether your patient is sensitised to the most common aeroallergens associated with asthma, including:[2]

- House dust mites
- Cat dander
- Dog dander
- Moulds
- Pollens (e.g. grass or tree)

How to test

Specific IgE blood tests can be requested through a local laboratory:

- Serum and plasma (EDTA or heparin) samples from venous or capillary blood can be used[14]*
- Can be performed irrespective of age, skin condition, medication, symptoms, or pregnancy[15–17]
- For further guidance contact your local laboratory

Patient management[2]

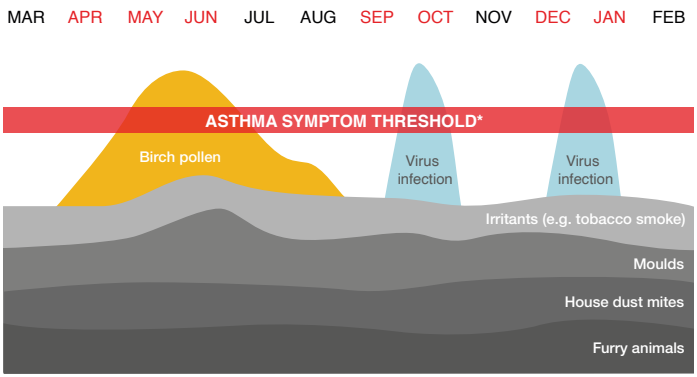
Positive test results in connection with physical examination and patient history enable an allergy diagnosis and targeted patient care:[2]

- Advice on allergens avoidance
- Appropriate symptomatic treatment
- Referral to a specialist, especially for allergen-specific immunotherapy
- A negative result suggests that additional investigation of the underlying causes of allergy-like symptoms is required.[2]

Note: As in all diagnostic testing, any diagnosis or treatment plan must be made by the clinician based on test results, individual patient history, the clinician's knowledge of the patient, as well as their clinical judgement.

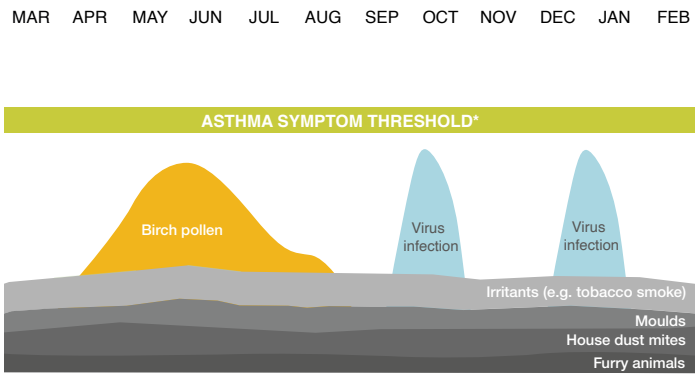
* Please refer to your local laboratory for specific specimen sample requirements.

Multiple allergic triggers can add up to asthma symptoms[11,18]



- Patient experiences symptoms when threshold* is exceeded.[19]
- An individual may have a number of triggers (average 3), which combined may lead to symptoms[19,20]

Exposure reduction works to reduce asthma exacerbations[20]



* Symptom threshold is the point at which the cumulative allergen load leads to asthma symptoms.[19]

References: 1. NICE Clinical Guideline CG116: Food allergy in under 19s: assessment and diagnosis. February 2011. **2.** Casale TB, et al. Allergy Clin Immunol Pract 2020; 8:2526-2532. **3.** 6. Høst A, et al. Allergy 2000; 55:600–608. **4.** Allen-Ramey F, et al. J Am Board Fam Pract 2005; 18:434–439. **5.** NICE Guideline NG80: Asthma diagnosis and monitoring of asthma in adults, children and young people. November 2017. **6.** Demoly P, et al. Journal of Asthma and Allergy 2022:15 1069–1080 **7.** Halvorsen R, et al. Int J Pediatr. 2009; 460737 **8.** Duran-Tauleria E, et al. Allergy. 2004; 59 Suppl 78:35-41 **9.** Fiocchi A, et al. Ann Allergy Asthma Immunol. 2004 Oct; 93(4): 328–33 **10.** Paganelli R, et al. Allergy. 1998; 53(8):763–8 **11.** Wickman M. Allergy 2005;60 (Suppl 79): 14–8 **12.** Pfaar O, et al. Allergol Select. 2022;6: 167-232. DOI 10.5414/ALX02331E **13.** Venkatesan P. 2023 GINA report for asthma. Lancet Respir Med. 2023 Jul;11(7):589. **14.** Direction for Use 52-5291-EN, ImmunoCAP™ Specific IgE. **15.** Siles RI, et al. Cleve Clin J Med. 2011;78(9):585-592. **16.** Bonnelykke K, et al. J Allergy Clin Immunol. 2008;121(3):646-651. **17.** Bacharier LB, et al. Allergy. 2008;63(1):5-34. **18.** Eggleston PA. Immunol Allergy Clin North Am 2003; 23:533–547 **19.** Wickman M. Allergy 2005; 60:14–18 **20.** Murray CS, et al. Am J Respir Crit Care Med 2017; 196:150–158.

Plant food allergen components

ImmunoCAP Specific IgE tests

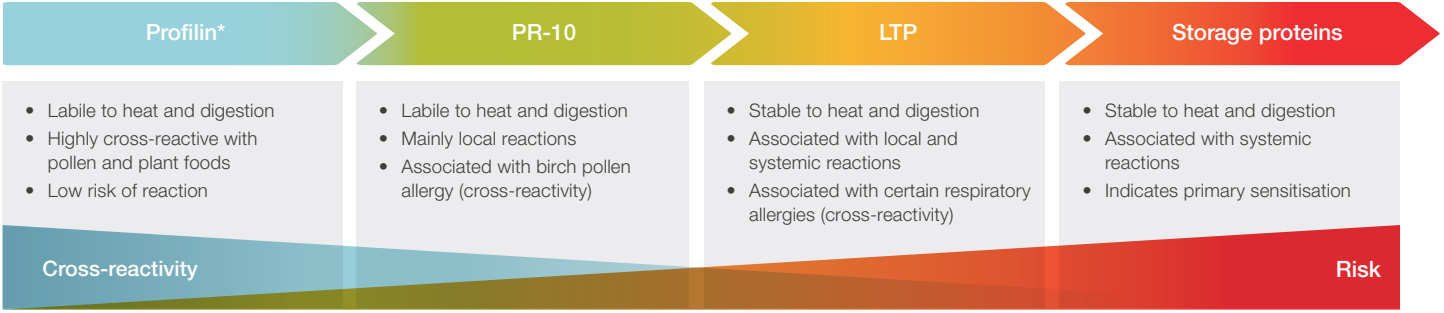
ImmunoCAP Allergen Components	Profilin*	PR-10	LTP	Storage proteins	Others‡
ImmunoCAP Whole Allergens	**Asymptomatic[1]** (usually)	**Local reactions[1]** (mainly)	**Local and systemic reactions[1]**	**Systemic reactions[1]**	
Peanut (f13)	**Profilin***	**Ara h 8** (f352)	**Ara h 9** (f427)	**Ara h 1** (f422) **Ara h 2** (f423) **Ara h 3** (f424) **Ara h 6** (f447)	
Hazelnut (f17)	**Profilin***	**Cor a 1** (f428)	**Cor a 8** (f425)	**Cor a 9** (f440) **Cor a 14** (f439)	
Walnut** (f256)	**Profilin***		**Jug r 3** (f442)	**Jug r 1** (f441)	
Cashew nut*(f202)	**Profilin***			**Ana o 2**** **Ana o 3** (f443)	
Brazil nut (f18)	**Profilin***			**Ber e 1** (f354)	
Soy (f14)	**Profilin***	**Gly m 4** (f353)		**Gly m 5** (f431) **Gly m 6** (f432)	
Sesame (f10)	**Profilin***			**Ses i 1** (f449)	
Buckwheat (f11)				**Fag e 2****	
Kiwi (f84)	**Profilin***	**Act d 8** (f430)			**Act d 1 / Act d 2 / Act d 5****
Apple (f49)	**Profilin***	**Mal d 1** (f434)	**Mal d 3** (f435)		
Peach (f95)	**Pru p 4** (f421)	**Pru p 1** (f419)	**Pru p 3** (f420)		**Pru p 7** (f454)
Celery (f85)	**Profilin***	**Api g 1** (f417)			
Wheat (f4)	**Profilin***		**Tri a 14** (f433)	**Tri a 19** (f416) **Gliadin** (f98)	

Results should always be interpreted in the context of the clinical history.

‡ Act d 1 --> cysteine protease, Act d 2 --> thaumatin-like protein, Act d 5--> defense protein, Pru p 7--> gibberellin-regulated protein (GRP), Tri a 19 --> Omega-5 gliadin

* Surrogate markers for profilin: Phl p 12, Bet v 2 or Pru p 4. ** Patients sensitised to pecan are very likely to be sensitised to walnut and vice versa. Jug r 1 and Jug r 3 may therefore be used as a risk markers for both pecan and walnut allergy.[1] *** Patients sensitised to pistachio are very likely to be sensitised to cashew nut and vice versa. Ana o 3 may therefore be used as a risk marker for both pistachio and cashew nut allergy.[1] **** ImmunoCAP ISAC$_{E112i}$ test only

Risk stratification



References: 1. Dramburg et al. Pediatr Allergy Immunol. 2023;34 Suppl 28:e13854.

Official product names: ImmunoCAP Allergen f17, Hazelnut; ImmunoCAP Allergen f428, Allergen component rCor a 1 PR-10 Hazelnut; ImmunoCAP Allergen f425, Allergen component rCor a 8 Hazelnut; ImmunoCAP Allergen f440, Allergen component nCor a 9 Hazelnut; ImmunoCAP Allergen f439, Allergen component rCor a 14 Hazelnut; ImmunoCAP Allergen f256, Walnut; ImmunoCAP Allergen f441, Allergen component rJug r 1 Walnut; ImmunoCAP Allergen f442, Allergen component rJug r 3 LTP, Walnut; ImmunoCAP Allergen f18, Brazil nut; ImmunoCAP Allergen f354, Allergen component rBer e 1 Brazil nut; ImmunoCAP Allergen f202, Cashew nut; ImmunoCAP Allergen f443, Allergen component rAna o 3, Cashew nut; ImmunoCAP Allergen f13, Peanut; ImmunoCAP Allergen f422, Allergen component rAra h 1 Peanut; ImmunoCAP Allergen f423, Allergen component rAra h 2 Peanut; ImmunoCAP Allergen f424, Allergen component rAra h 3 Peanut; ImmunoCAP Allergen f447, Allergen component rAra h 6 Peanut; ImmunoCAP Allergen f352, Allergen component rAra h 8 PR-10, Peanut; ImmunoCAP Allergen f427, Allergen component rAra h 9 L TP, Peanut; ImmunoCAP Allergen f14, Soybean; ImmunoCAP Allergen f431, Allergen component nGly m 5 beta-conglycinin, Soy; ImmunoCAP Allergen f432, Allergen component nGlym 6 Glycinin, Soy; ImmunoCAP Allergen f353, Allergen component rGly m 4 PR-10, Soy ImmunoCAP Allergen f10, Sesame seed; ImmunoCAP Allergen f449, Allergen Component rSes i 1 Sesame seed. ImmunoCAP Allergen f95, Peach; ImmunoCAP Allergen f419, Allergen component rPru p 1 PR-10, Peach; ImmunoCAP Allergen f420, Allergen component rPru p 3 LTP,Peach; ImmunoCAP Allergen f421, Allergen component rPru p 4 Profilin, Peach; ImmunoCAP Allergen f454, Allergen component rPru p 7 Peach ImmunoCAP Allergen f4, Wheat; ImmunoCAP Allergen f416, Allergen component rTri a 19 Omega-5 Gliadin, Wheat; ImmunoCAP Allergen f433, Allergen component rTri a 14 LTP, Wheat, ImmunoCAP Allergen f49, Apple, ImmunoCAP Allergen f85, Celery, ImmunoCAP Allergen f434, Allergen component rMal d 1 PR-10, Apple, ImmunoCAP Allergen f435, Allergen component rMal d 3 LTP, Apple, ImmunoCAP Allergen f430, ImmunoCAP Allergen f84, Kiwi, Allergen component rAct d 8 PR-10, Kiwi ImmunoCAP Allergen f417, Allergen component rApi g 1 PR-10, Celery, ImmunoCAP Allergen f98, Gliadin

Peanut allergy

ImmunoCAP Specific IgE tests

ImmunoCAP Whole Allergen

Peanut (f13)

ImmunoCAP Allergen Components

Profilin*	Ara h 8 (f352)	Ara h 9 (f427)	Ara h 1 (f422), Ara h 2 (f423), Ara h 3 (f424), Ara h 6 (f447)
Profilin	PR-10	LTP	Storage proteins
Asymptomatic[1] (usually)	**Local reactions**[1] (mainly)	**Local and systemic reactions**[1]	**Systemic reactions**[1]
• Labile to heat and digestion • Highly cross-reactive with pollen and plant foods • Low risk of reaction	• Labile to heat and digestion • Mainly local reactions • Associated with birch pollen allergy (cross-reactivity)	• Stable to heat and digestion • Associated with local and systemic reactions • Associated with allergy to stone fruits (cross-reactivity)	• Stable to heat and digestion • Associated with systemic reactions • Indicates primary sensitisation

Cross-reactivity ↔ Risk

Molecular Allergology User's Guide 2.0 summary[1]

- IgE to peanut components is a valuable tool for the clinician to diagnose and manage peanut allergy in children and adults.
- Knowing which allergen the patient is sensitised to can help to predict the severity of allergic reaction and prognosis.

* Surrogate markers for profilin: Phl p 12, Bet v 2 or Pru p 4

Peanut (f13)	PR-10 Ara h 8	LTP Ara h 9	Storage proteins Ara h 1/2/3/6	Interpreting results*	Management considerations
+/−	+/−	+/−	+	**High risk of severe, systemic symptoms**[1–16] Primary peanut allergy is likely – high risk of severe systemic symptoms, especially if Ara h 2 or Ara h 6 are positive.	• Peanut avoidance • Consider investigations for tree nut avoidance • Consider, in context of other risk factors, prescription of an adrenaline autoinjector
+/−	+/−	+	−	**Risk of local and systemic reactions**[1–16] Primary peanut allergy is unlikely; this is likely a crossreaction to other nsLTPs in stone fruits which can increase the risk of systemic reactions.	• Consider investigation for stone fruit sensitisation and subsequent avoidance • Consider, in context of other risk factors, prescription of an adrenaline autoinjector
+/−	+	−	−	**Risk of local reactions (usually)**[1,16] If mono-sensitised, this is likely a cross-reactivity to birch pollen.	• Consider a controlled peanut challenge to rule out peanut allergy, and testing with Bet v 1 (PR-10; t215) to confirm birch sensitisation • If birch pollen sensitised and mono-sensitised to Ara h 8 consider seasonal antihistamines and/or allergen-specific immunotherapy
+	−	−	−	If all components of the algorithm are negative and f13 is positive, the patient could be sensitised to an untested allergen such as profilins, cross-reactive carbohydrate determinants (CCD) or other allergens.[1]	

* Results should always be interpreted in the context of the clinical history.

References: 1. Dramburg S, et al. Pediatr Allergy Immunol. 2023;34 Suppl 28:e13854. **2.** Mattsson L, et al. Clinical & Experimental Allergy 2021;51. **3.** WHO/IUIS Allergen Nomenclature Sub-Committee. Allergen nomenclature. www.allergen.org 2023. Last accessed: November 2023. **4.** Nicolaou, N, et al. J Allergy Clin Immunol 2010; 125:191-197. **5.** Sicherer SH, et al. J Allergy Clin Immunol 2010; 125;1322-1326. **6.** Rona, RJ, et al. J Allergy Clin Immunol 2007; 120(3):638-646. **7.** Lange L, et al. Allergo J Int 2014; 23:158–63. **8.** Mortz CG, et al. Paediatr Allergy Immunol 2005; 16:501-506. **9.** Eller E, et al. Allergy 2013; 68(2):190-194. **10.** Dang TD, et al. J Allergy Clin Immunol 2012; 129(4):1056-1063. **11.** Nicolaou N,. et al. J Allergy Clin Immunol 2011; 127(3):684-685. **12.** Kukkonen AK, et al. Allergy 2015; 70(10):1239-45. **13.** Rajput S, et al. Journal of Allergy and Immunol 2017. **14.** Van Erp FC, et al. Journal of Allergy and Immunol 2016. **15.** Klemans RJ, et al. Allergy 2014; 69(8):1112-4. **16.** Kleine-Tebbe J, et al. Editors: Molecular Allergy Diagnostics. Springer International Publishing Switzerland 2017.

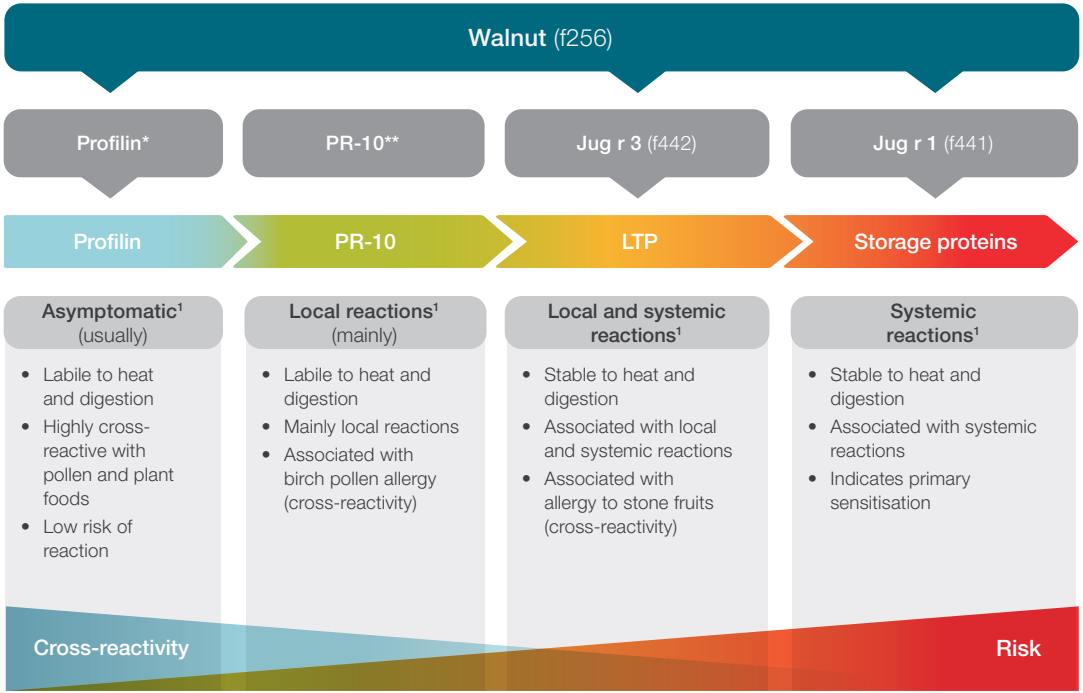
Official product names: ImmunoCAP Allergen f13, Peanut; ImmunoCAP Allergen f422, Allergen component rAra h 1 Peanut; ImmunoCAP Allergen f423, Allergen component rAra h 2 Peanut; ImmunoCAP Allergen f424, Allergen component rAra h 3 Peanut; ImmunoCAP Allergen f447, Allergen component rAra h 6 Peanut; ImmunoCAP Allergen f352, Allergen component rAra h 8 PR-10, Peanut; ImmunoCAP Allergen f427, Allergen component rAra h 9 LTP, Peanut; ImmunoCAP Allergen SAS, U1370, rAra h 18

Walnut allergy

ImmunoCAP Specific IgE tests

ImmunoCAP Whole Allergen

ImmunoCAP Allergen Components



* Surrogate markers for profilin: Phl p 12, Bet v 2 or Pru p 4 ** Surrogate markers for PR-10: Bet v 1 or Cor a 1[1,2]

Walnut and pecan nut share a **high homology** between proteins, and their allergens are highly cross-reactive. Patients sensitised to pecan nuts very likely to also be sensitised to walnut and vice versa.

Jug r 1 and **Jug r 3** are therefore risk markers for both pecan and walnut allergy.[3–6]

Walnut (f256)	LTP Jug r 3	Storage protein Jug r 1	Interpreting results*	Management considerations[1,3–8]
+/−	+/−	+	High risk of severe, systemic symptoms[1,5–8]	• Walnut avoidance • Primary sensitisation to walnut • Consider prescription of an adrenaline autoinjector
+/−	+	−	Risk of local and systemic reactions[1,7,8]	• Walnut avoidance • Mixed allergy is possible, including systemic and local symptoms such as oral allergy syndrome (OAS) • The patient may be sensitized to other nsLTPs contained in other plant foods/pollens due to cross-reactions which can cause systemic symptoms in cooked and uncooked foods • Consider prescription of an adrenaline autoinjector
+	−	−	If all components of the algorithm are negative and f256 is positive, the patient could be sensitised to an untested allergen such as profilins, cross-reactive carbohydrate determinants (CCD) or other allergens.[1]	

* Results should always be interpreted in the context of the clinical history.

References: 1. Dramburg S, et al. Pediatr Allergy Immunol. 2023;34 Suppl 28:e13854. **2.** Chruszcz M, et al. PLoS ONE 201813(11): e0208276. **3.** Mew R, et al. Ped Allergy and Immunol 2016;27(7):750-752. **4.** Costa J, et al. Clinical & Experimental Allergy, 2014 (44) 319–341. **5.** Teuber SS, et al. J Allergy Clin Immunol 1998; 101:807–14. **6.** Andorf S, et al. J Allergy Clin Immunol. 2017;5(5):1325-1334 **7.** Kleine-Tebbe J, et al. Springer International Publishing Switzerland 2017. ISBN 978-3-319-42499-6 (eBook) **8.** Bradshaw N. A Clinical Reference Guide to Molecular Allergy. Go Molecular! Part 2: The allergen components 2021.

Official product names: ImmunoCAP Allergen f256, Walnut; ImmunoCAP Allergen f441, Allergen component rJug r 1, Walnut; ImmunoCAP Allergen f442, Allergen component rJug r 3 LTP, Walnut;

Cashew nut allergy

ImmunoCAP Specific IgE tests

ImmunoCAP Whole Allergen

Cashew nut (f202)

ImmunoCAP Allergen Components

Profilin*	PR-10**	LTP**	Ana o 3 (f443), Ana o 2***
Profilin	PR-10	LTP	Storage proteins
Asymptomatic[1] (usually)	**Local reactions**[1] (mainly)	**Local and systemic reactions**[1]	**Systemic reactions**[1]
• Labile to heat and digestion • Highly cross-reactive with pollen and plant foods • Low risk of reaction	• Labile to heat and digestion • Mainly local reactions • Associated with birch pollen allergy (cross-reactivity)	• Stable to heat and digestion • Associated with local and systemic reactions • Associated with allergy to stone fruits (cross-reactivity)	• Stable to heat and digestion • Associated with systemic reactions • Indicates primary sensitisation

Cross-reactivity ↓ Risk ↑

EAACI 2023 guidelines

In patients with a history of suspected IgE-mediated allergy to cashew, specific IgE to Ana o 3 is recommended in addition to skin prick test and/or IgE to extract.[2]

Cashew nut and pistachio are closely related and highly cross-reactive[1,3]

Ana o 3 is a good predictor for clinical reactivity to cashew & pistachio nut.[4,5]

* Surrogate markers for profilin: Phl p 12, Bet v 2 or Pru p 4 ** No PR-10 and LTP referenced for cashew nuts in the WHO/IUIS
*** ImmunoCAP ISAC$_{E112}$ test only

Cashew nut (f202)	Storage protein Ana o 3	Interpreting results*	Management considerations[1–7]
		High risk of severe, systemic symptoms[1–7]	• Primary sensitisation to cashew nut • Pistachio potential co-sensitisation, Ana o 3 is a diagnostic tool also for pistachio allergy • Consider prescription of an adrenaline autoinjector
		If all components of the algorithm are negative and f202 is positive, the patient could be sensitised to an untested allergen such as profilins, cross-reactive carbohydrate determinants (CCD) or other allergens.[1]	

* Results should always be interpreted in the context of the clinical history.

References: 1. Dramburg S, et al. Pediatr Allergy Immunol. 2023;34 Suppl 28:e13854. **2.** Santos AF, et al. Allergy. 2023 **3.** Van der Valk JMP, et al. Clin Exp Allergy 2016;47:113–120. **4.** Lange L, et al. Allergy 2017;72(4):598-603. **5.** Savvatianos S, et al. J Allergy Clin Immunol 2015;136(1):192-5. **6.** Robotham JM, et al. J Allergy Clin Immunol 2005;115(6):1284-1290. **7.** Kleine-Tebbe J, et al. Springer International Publishing Switzerland 2017. ISBN 978-3-319-42499-6 (e Book).

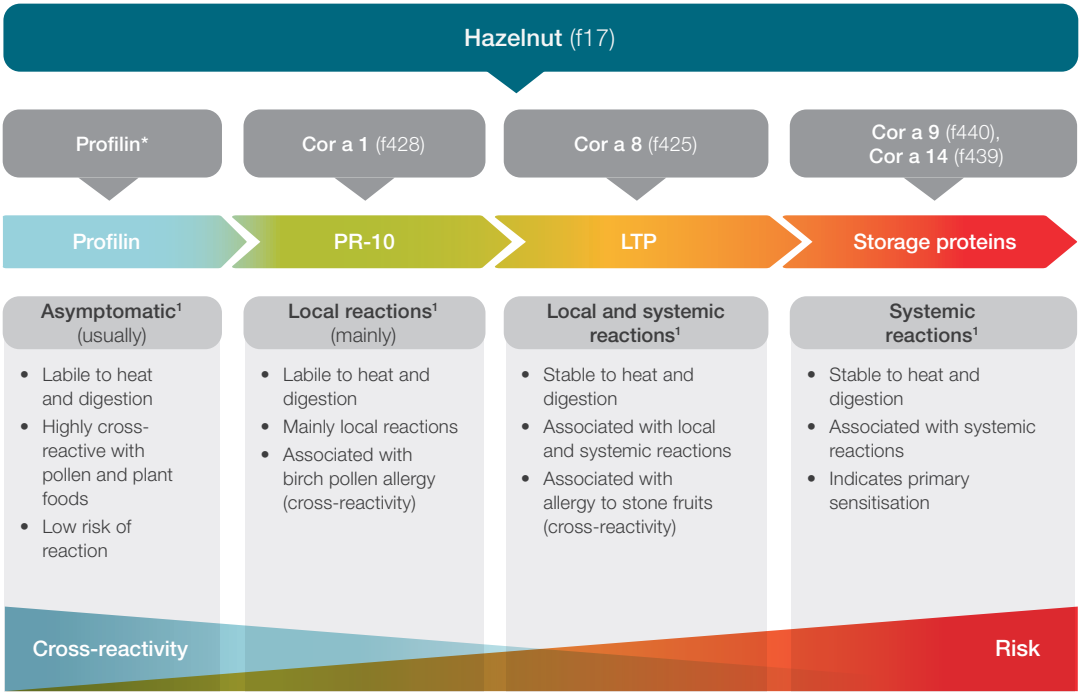
Official product names: ImmunoCAP Allergen f202, Cashew nut; ImmunoCAP Allergen f443, Allergen component rAna o 3, Cashew nut

Hazelnut allergy

ImmunoCAP Specific IgE tests

ImmunoCAP Whole Allergen

ImmunoCAP Allergen Components



* Surrogate markers for profilin: Phl p 12, Bet v 2 or Pru p 4

Good to know

"Of the specific tree nut allergies, hazelnut allergy is the most common in Europe."[2]

Hazelnut (f17)	PR-10 Cor a 1	LTP Cor a 8	Storage proteins Cor a 9 / Cor a 14	Interpreting results*	Management considerations
+/−	+/−	+/−	+	**High risk of severe, systemic symptoms**[1,3–10] Primary hazelnut allergy is likely – high risk of severe systemic symptoms	• Hazelnut avoidance • Consider investigations for other tree nut avoidance • Consider, in context of other risk factors, prescription of an adrenaline autoinjector
+/−	+/−	+	−	**Risk of local and systemic reactions**[1,10,11] Primary peanut allergy is unlikely; this is likely a crossreaction to other nsLTPs in stone fruits which can increase the risk of systemic reactions.	• Consider investigation for stone fruit sensitisation and subsequent avoidance • Consider, in context of other risk factors, prescription of an adrenaline autoinjector
+/−	+	−	−	**Risk of local reactions (usually)**[1,10,12–15] If mono-sensitised, this is likely a cross-reactivity to PR-10-containing pollens and plant foods	• Hazelnut avoidance
+	−	−	−	If all components of the algorithm are negative and/or f17 is positive, the patient could be sensitised to an untested allergen such as profilins, cross-reactive carbohydrate determinants (CCD) or other allergens.[14] If all tests are negative, a hazelnut allergy is unlikely – consider alternative investigations. If clinical suspicion persists consider a oral food challenge (OFC).[1]	

* Results should always be interpreted in the context of the clinical history.

References: 1. Dramburg S, et al. Pediatr Allergy Immunol. 2023;34 Suppl 28:e13854. **2.** G. C. I. Spolidoro, et al. Allergy 2023, 78(2):351-368. **3.** Faber M, et al. Int Arch Allergy Immunol 2014; 164:200–206. **4.** Kattan DJ, et al. J Allergy Clin Immunol Pract 2014; 2(5): 633–634. **5.** Carraro S, et al. Pediatric Allergy and Immunol 2016; 27(3):322-4. **6.** Eller E, et al. Allergy 2016; n71:556–562. **7.** Beyer K, et al. Allergy 2015; 70: 90–98. **8.** Masthoff L, et al. J Allergy Clin Immunol 2013; 132(2):393-9. **9.** Brandström J, et al. Clin Exp Allergy 2015; 45(9):1412-8. **10.** Kleine-Tebbe J, et al. Editors: Molecular Allergy Diagnostics. Springer International Publishing Switzerland 2017. **11.** Flinterman AE, et al. J Allergy Clin Immunol 2008; 121(2):423-428. **12.** Hansen KS, et al. Allergy 2003; 58(2):132-138. **13.** Anhoej C, et al. Allergy 2001; 56(6):548-552. **14.** Kalyoncu AF, et al. Allergol Immunopathol 1995; 23(2):94-95. **15.** Bindslev-Jensen C, et al. Allergy 1991; 46(8): 610-613.

Official product names: ImmunoCAP Allergen f17, Hazelnut; ImmunoCAP Allergen f440, Allergen component nCor a 9, Hazelnut; ImmunoCAP Allergen f439, Allergen component rCor a 14, Hazelnut; ImmunoCAP Allergen f428, Allergen component rCor a 1 PR-10, Hazelnut; ImmunoCAP Allergen f425, Allergen component rCor a 8, Hazelnut

Tree nut and peanut allergies

ImmunoCAP Specific IgE tests

50% of children that are allergic to one tree nut are allergic to another tree nut.[1]

ImmunoCAP Allergen Components	Profilin*	PR-10	LTP	Storage proteins
ImmunoCAP Whole Allergens	**Asymptomatic[2]** (usually)	**Local reactions[2]** (mainly)	**Local and systemic reactions[2]**	**Systemic reactions[2]**
Peanut (f13)	**Profilin***	**Ara h 8** (f352)	**Ara h 9** (f427)	**Ara h 1** (f422) **Ara h 2** (f423) **Ara h 3** (f424) **Ara h 6** (f447)
Hazelnut (f17)	**Profilin***	**Cor a 1** (f428)	**Cor a 8** (f425)	**Cor a 9** (f440) **Cor a 14** (f439)
Walnut** (f256)	**Profilin***		**Jug r 3** (f442)	**Jug r 1** (f441)
Cashew nut*(f202)	**Profilin***			**Ana o 2**** **Ana o 3** (f443)
Brazil nut (f18)	**Profilin***			**Ber e 1** (f354)
	• Labile to heat and digestion • Highly cross-reactive with pollen and plant foods • Low risk of reaction	• Labile to heat and digestion • Mainly local reactions • Associated with birch pollen allergy (cross-reactivity)	• Stable to heat and digestion • Associated with local and systemic reactions • Associated with allergy to fruits (cross-reactivity)	• Stable to heat and digestion • Associated with systemic reactions • Indicates primary sensitisation

Cross-reactivity → Risk

* Surrogate markers for profilin: Phl p 12, Bet v 2 or Pru p 4. ** Patients sensitised to pecan are very likely to also be sensitised to walnut and vice versa. Jug r 1 and Jug r 3 may therefore be used as a risk marker for both pecan and walnut allergy.[3] *** Patients sensitised to pistachio are very likely to also be sensitised to cashew nut and vice versa. Ana o 3 may therefore be used as a risk marker for both pistachio and cashew nut allergy.[4] **** ImmunoCAP ISAC$_{E112i}$ test only

Whole allergens Peanut / hazelnut / walnut / cashew nut / Brazil nut	PR-10 Ara h 8 / Cor a 1	LTP Ara h 9 / Cor a 8 / Jug r 3	Storage proteins Ara h 1 / 2 / 3 / 6 Cor a 9 / 14 / Jug r 1 Ana o 3 / Ber e 1	Interpreting results*	Management considerations[2–26]
+/−	+/−	+/−	+	High risk of severe, systemic symptoms	• Avoid the nut that tested positive • Patient likely to react to oral food challenge (OFC) • Other potential co-sensitisations (e.g. peanuts, tree nuts, and seeds): consider investigations for nut avoidance • Consider, in context of other risk factors, prescription of an adrenaline autoinjector
+/−	+/−	+	−	Risk of local and systemic reactions	• Avoid the nut that tested positive • Consider investigation for other nsLTP sensitisation (e.g. fruits, tree nuts, wheat) • Consider, in context of other risk factors, prescription of an adrenaline autoinjector
+/−	+	−	−	Risk of local reactions (usually)	• If monosensitised, this is likely a cross-reactivity to PR-10-containing pollen and plant foods • OFC with a specialist may be recommended
+	−	−	−	If all components of the algorithm are negative and an extract is positive, the patient could be sensitised to an untested allergen such as profilins, cross-reactive carbohydrate determinants (CCD) or other allergens.[14] If all tests (extacts and allergen components) are negative, a tree nut allergy is unlikely – consider alternative investigations. If clinical suspicion persists consider an OFC.	

* Results should always be interpreted in the context of the clinical history.

References: 1. McWilliam V, et al. J Allergy Clin Immunol 2019;143(2):644. **2.** Dramburg S, et al. Pediatr Allergy Immunol. 2023;34 Suppl 28:e13854. **3.** Teuber SS, et al. J Allergy Clin Immunol. 2000;105:S140 **4.** Savvatianos S, et al. Allergy Clin Immunol. 2015;136:192-4 **5.** Geiselhart S, et al. Mol Immunology 2018 Aug;100:71-81. **6.** Pastorello E, et al. J Allergy Clin Immunol 2004; 114(4): 908–14. **7.** Rosenfeld L, et al. Int Arch Allergy Immunol. 2012; 157:238-245. **8.** Masthoff L, et al. Allergy 2013; 68: 983– 993. **9.** Egger M, et al. Curr Allergy Asthma Rep 2010; 10:326–335. **10.** www.allergen.org. **11.** Davoren M, et al. Arch Dis Child 2005; 90(10): 1084 –5. **12.** Robotham J, et al. J Allergy ClinImmunol. 2005; 115(6): 1284–90. **13.** Clark A, et al. Allergy 2007; 62(8): 913–6. **14.** Borja J, et al. Allergy 54, 1999 / 1004-1013. **15.** Masthoff L, et al. J Allergy Clin Immunol. 2013(In press). **16.** Flinterman AE, et al. Allergy Clin Immunol. 2008 Jun; 8(3): 261–5. **17.** De Knop KJ, et al. Pediatr Allergy Immunol. 2011 Feb; 22(1Pt 2): e139– 49. **18.** Hansen KS, et al. Allergy. 2003 Feb; 58(2): 132–8. **19.** Pastorello EA, et al. J Allergy Clin Immunol. 2002; 109(3): 563–70. **20.** Schocker F, et al. J Allergy Clin Immunol. 2004;113:141-7. **21.** Hansen KS, et al. J Allergy Clin Immunol. 2009 Apr 1; 123(5): 1134–41. **22.** Garino C, et al. Mol. Nutr. Food Res. 2010; 54: 1257–1265 **23.** Bradshaw N. A Clinical Reference Guide to Molecular Allergy. Go Molecular! Molecular Allergy –The Basics, 2014 **24.** Katelaris CH, et al. Allergy Clin Immunol 2010, 10:246–251. **25.** Sastre J, et al. Clin Exp Allergy 2010, 40:1442–1460. **26.** Nucera E, et al. Postepy Dermatol Alergol. 2015 Aug; 32(4): 255–261.

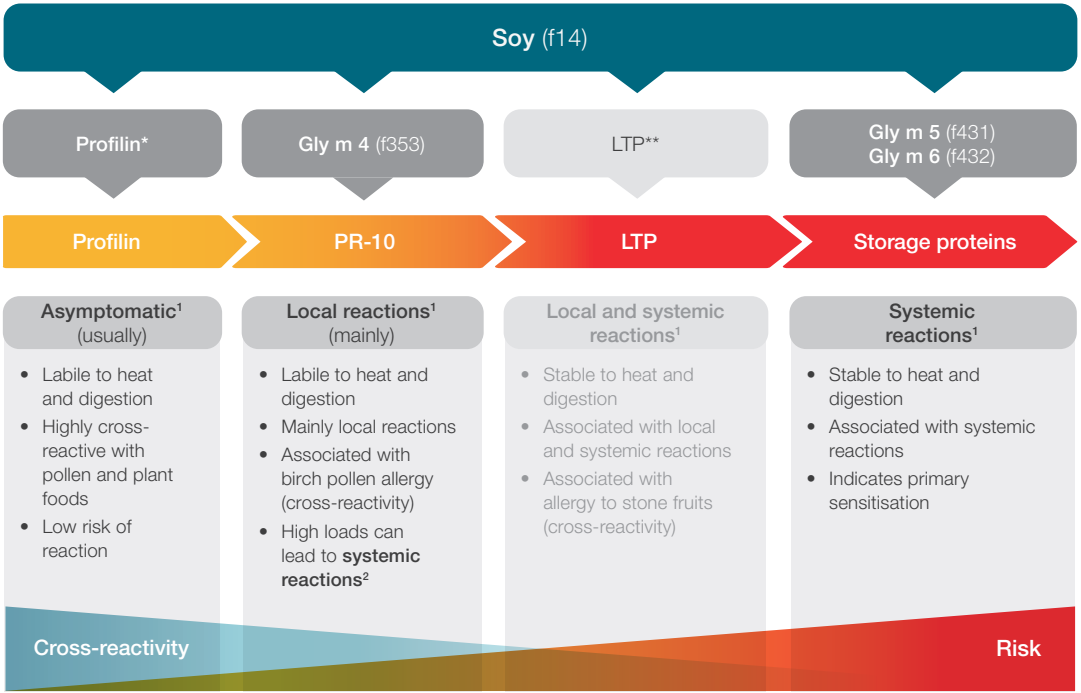
Official product names: ImmunoCAP Allergen f17, Hazelnut; ImmunoCAP Allergen f428, Allergen component rCor a 1 PR-10 Hazelnut; ImmunoCAP Allergen f425, Allergen component rCor a 8 Hazelnut; ImmunoCAP Allergen f440, Allergen component nCor a 9 Hazelnut; ImmunoCAP Allergen f439, Allergen component rCor a 14 Hazelnut; ImmunoCAP Allergen f256, Walnut; ImmunoCAP Allergen f441, Allergen component rJug r 1 Walnut; ImmunoCAP Allergen f442, Allergen component rJug r 3 LTP, Walnut; ImmunoCAP Allergen f18, Brazil nut; ImmunoCAP Allergen f354, Allergen component rBer e 1 Brazil nut; ImmunoCAP Allergen f202, Cashew nut; ImmunoCAP Allergen f443, Allergen component rAna o 3, Cashew nut; ImmunoCAP Allergen f13, Peanut; ImmunoCAP Allergen f422, Allergen component rAra h 1 Peanut; ImmunoCAP Allergen f423, Allergen component rAra h 2 Peanut; ImmunoCAP Allergen f424, Allergen component rAra h 3 Peanut; ImmunoCAP Allergen f447, Allergen component rAra h 6 Peanut; ImmunoCAP Allergen f352, Allergen component rAra h 8 PR-10, Peanut; ImmunoCAP Allergen f427, Allergen component rAra h 9 L TP, Peanut;

Soy allergy

ImmunoCAP Specific IgE tests

ImmunoCAP Whole Allergen

ImmunoCAP Allergen Components



* Surrogate markers for profilin: Phl p 12, Bet v 2 or Pru p 4 ** No LTP referenced for soy in the WHO/IUIS

Good to know!

Up to 10% of all patients with birch sensitisation may also be at risk of reactions to soy, including risk of systemic reaction, especially when consuming less processed soy products.[3]

Soy (f14)	PR-10 Gly m 4#	Storage proteins Gly m 5 / Gly m 6	Interpreting results*	Management considerations
+/−	+/−	+	**High risk of severe, systemic symptoms**[4-6] Primary soy allergy is likely. Potential high risk of severe systemic symptoms.	• Soy avoidance • Consider, in context of other risk factors, prescription of an adrenaline autoinjector
+/−	+	−	**Risk of local and systemic reactions**[3,7] Mainly local reaction, however high loads can lead to systemic reactions.	• Soy avoidance • Consider confirming the soy allergen load, especially if the patient is sensitised to Bet v 1. Check for possible consumption of unprocessed soy in drinks (soy milk) and dietary protein powders
+	−	−	If all components of the algorithm are negative and f14 is positive, the patient could be sensitised to an untested allergen.[1]	

* Results should always be interpreted in the context of the clinical history # Gly m 4 content can be very low in soy extract-based tests. Therefore tests with Gly m 4 allergen component is recommended as supplement to testing with whole allergen.[2]

References: 1. Dramburg S, et al. Pediatr Allergy Immunol 2023;34(Suppl 28):e13854. **2.** Kosma P, et al. Acta Paediatr 2011;100(2):305-306. **3.** Mittag D, et al. J Allergy Clin Immunol 2004;113:148–154. **4.** Holzhauser, T, et al. J Allergy Clin Immunol 2009;123(2);452-458. **5.** Ito T, et al. J Allergy Clin Immunol 2010;125;2(Suppl 1):AB88. **6.** Kleine-Tebbe, J. and Jakob, T. 2017. Editors: Molecular Allergy Diagnostics. Springer International Publishing Switzerland. **7.** Ebisawa M, et al. J Allergy Clin Immunol 2013;132:976-978 e1-5.

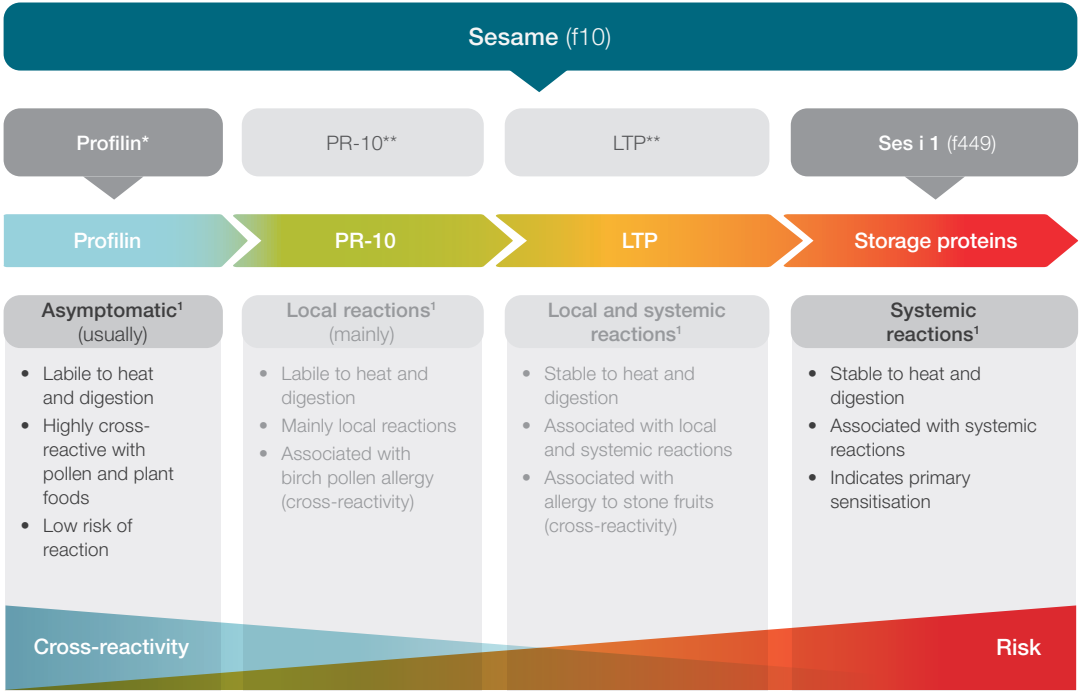
Official product names: ImmunoCAP Allergen f14, Soybean; ImmunoCAP Allergen f431, Allergen component nGly m 5 beta-conglycinin, Soy; ImmunoCAP Allergen f432, Allergen component nGly m 6 Glycinin, Soy; ImmunoCAP Allergen f353, Allergen component rGly m 4 PR-10, Soy

Sesame allergy

ImmunoCAP Specific IgE tests

ImmunoCAP Whole Allergen

ImmunoCAP Allergen Components



Good to know!

- Sesame is often a **hidden allergen**, therefore there is a high risk of accidental exposure.[2]
- Sesame allergic patients have a high risk of experiencing **severe allergic reactions**. It has been reported to be even higher than for peanut and tree nut for some allergic patients.[2,3]

*Surrogate markers for profilin Phl p 12, Bet v 2 or Pru p 4 **No PR-10 and LTP referenced for sesame seeds in the WHO/IUIS

Sesame (f10)	Storage protein Ses i 1	Interpreting results*	Management considerations
		Primary sesame allergy is likely	• High risk of severe, systemic symptoms[4–9] • Sesame avoidance • Consider investigations for other potential co-sensitisations (e.g. other seeds and tree nuts) • Consider, in context of other risk factors, prescription of an adrenaline autoinjector
		Low probability of primary sesame allergy	• Consider further sIgE testing with ImmunoCAP Whole Allergen tests for pollens, which may explain the sensitisation to sesame extract. • If suspicion of a food allergy persists, consider further sIgE testing for tree nuts and seeds, or consider alternative investigations such as sesame oral food challenge[5,6]

* Results should always be interpreted in the context of the clinical history.

References: 1. Dramburg S, et al. Pediatr Allergy Immunol 2023;34(Suppl 28):e13854. **2.** Adatia A, et al. J Asthma Allergy 2017;10:141-151. **3.** Brough HA, et al. J Allergy Clin Immunol 2020;145(4):1231-1239. **4.** Maruyama N, et al. Clin Exp Allergy 2016;46(1):163-71. **5.** Yanagida N, et al. J Allergy Clin Immunol Pract 2019;7(6):2084-86. **6.** Saf S, et al. J Allergy Clin Immunol Pract 2020;8(5):1681-1688. **7.** Goldberg MR, et al. Pediatr Allergy Immunol 2021. **8.** Nachshon L, et al. J Allergy Clin Immunol Pract 2019;7:2775-81. **9.** Pastorello EA, et al. J Chromatogr B Biomed Sci Appl 2001;756(1-2):85-93.

Official product names: ImmunoCAP Allergen f10 Sesame seed; ImmunoCAP Allergen f449, Allergen Component rSes i 1, Sesame seed

Alpha-Gal syndrome

ImmunoCAP Specific IgE tests

ImmunoCAP Whole Allergens

Pork (f26) +/- **Beef** (f27) +/- **Lamb** (f88)

ImmunoCAP Allergen Component

Alpha-Gal (o215)

Good to know

Isolated gastrointestinal (GI) symptoms can be due to sensitisation to alpha-Gal.[1]

In a typical alpha-Gal allergic patient:

- Diagnosis is supported by IgE to several mammalian meat.[2-3]
- IgE levels to alpha-Gal > IgE to mammalian meat.[3-4]

Red meat	Alpha-Gal	Interpreting results[5–7]*
+/−	+	**Interpreting results:*** Consider alpha-Gal syndrome (AGS) **Management considerations:** • Avoidance of all mammalian (red) meat • Possible need to avoid milk, gelatin containing food and certain medications • Consider prescribing epinephrine auto injector
+	−	**Interpreting results:*** Consider a meat allergy due to sensitisation to one or more red meat allergens (beef, lamb, pork) **Management considerations:** • Avoidance of specific sensitised mammalian meat • Consider prescribing epinephrine auto injector • May need to consider testing cross reactive proteins (e.g. milk, pork-cat syndrome)
−	−	**Interpreting results:*** Consider other clinical factors or findings **Management considerations:** • Consider other clinical factors or findings • Oral food challenge (OFC) with a specialist may be recommended. High likelihood that patient may pass OFC.

** Results should be interpreted in the context of the clinical history*

References: 1. Wilson JM, et al. Allergy. 2024 Jun;79(6):1440-1454. **2.** Commins SP, et al. J Allergy Clin Immunol. 2014;134:108-15. **3.** Kennedy JL, et al. Pediatrics. 2013;131:e1545-52. **4.** Hamsten C, et al. J Allergy Clin Immunol. 2013;132:1431-4. **5.** Platts-Mills T, et al. J Allergy Clin Immunol Pract .2020; 8(1): 15-23. e1. **6.** Jackson WL. Oxf Med Case Reports. 2018 Feb 21;2018(2):omx098. **7.** Dramburg S, et al. Pediatr Allergy Immunol 2023;34(Suppl 28):e13854. **8.** Commins SP, et al. J Allergy Clin Immunol. 2011;127:1286-93 e6. **9.** Commins SP, et al. Curr Allergy Asthma Rep. 2013;13:72-7. **10.** Morisset M, et al. Allergy. 2012;67:699-704. **11.** Caponetto P, et al. J Allergy Clin Immunol Pract. 2013;1:302-3. **12.** Fischer J, et al. J Allergy Clin Immunol. 2014;134:755-9 e1. **Official product names:** ImmunoCAP Allergen f26, Pork, ImmunoCAP Allergen f27, Beef, ImmunoCAP Allergen f88, Mutton, ImmunoCAP Allergen o215, Component nGal-alpha-1,3-Gal (alpha-Gal) Thyroglobulin, bovine

Multiple factors may explain the sudden reactions:

Alpha-Gal sensitisation

IgE levels are likely to drop over time and can increase following new tick bites[8]

+

Red meat consumption

The greater amount eaten and the fattier the cut, the higher the probability of a reaction[9]

Delayed reactions

- Hives, GI-distress and/or anaphylaxis[1-3]
- Typically, 3-6 hour* delay but can also be rapid[1-2]

Tick bite/s

Known/unknown tick bite history

Co-factors may potentiate the effect[1,7,10-12]

- Physical exercise
- Alcohol
- Nonsteroidal anti-inflammatory drugs (NSAIDs)
- Infection

Risk of reaction in AGS:[5]

	Food	Medications/ biologic therapies
Higher risk	Beef, pork, lamb, innards	Cetuximab
		Gelatin plasma expanders
		Anti-venom (e.g. CroFab)
		Bovine/porcine heart valves
	Dairy	Gelatin-containing vaccines (e.g. Zostavax, MMR)
		Pancreatic enzyme replacement (e.g. pancrelipase)
		Heparin
Lower risk	Gelatin-containing foods	Gelcaps

Adapted from Platts-Mills T et al. Diagnosis and management fo patients with alpha-Gal syndrome. J Allergy Clin Immunol Pract .2020; 8(1): 15-23. e1.

Egg allergy

ImmunoCAP Specific IgE tests

ImmunoCAP Whole Allergen

Egg white (f1)

ImmunoCAP Allergen Components

Gal d 1 (f233)
Ovomucoid

Gal d 2 (f232) / **Gal d 3** (f323)
Ovalbumin / Conalbumin

Gal d 4 (k208)
Lysozyme

Sensitisation to multiple egg allergens may be a prognostic marker that could be useful for patient management.[2]

- Sensitisation to non-ovomucoid component predicts high chances of spontaneous tolerance.
- Isolated ovomucoid sensitisation doubles the risk of persistence.
- Sensitisation to multiple egg allergens quadruples the risk of persistence.

Risk of reaction to raw and cooked egg[1]

- Resistant to heat denaturation
- Marker of persistent egg allergy
- Heat and digestion stable
- Highly allergenic

Risk of reaction to raw egg[1]

- Susceptible to heat denaturation*
- Ovalbumin is the most abundant egg white protein
- Risk for clinical reaction to raw and lightly cooked egg

Risk of reaction to raw egg[1]

- Susceptible to heat denaturation*
- Risk for clinical reaction to raw and lightly cooked egg
- Lysozyme, a glycosidase, has been reported to be extensively utilized by food (cheese, wine, etc.) and pharmaceutical (like eye drops) industry as a preservative due to its antibacterial properties[3-6]

* Recommended method of heating is to bake in the oven at 180°C for 30 min.[7]

Egg yolk (f75) also contains specific allergens such as livetin/chicken serum albumin (Gal d 5). Egg yolk may be somewhat less allergenic than egg white,[8] but sensitisation to Gal d 5 in egg yolk is related to the bird/egg syndrome.[9] The allergen component Gal d 5 is available on ImmunoCAP ISAC$_{E112i}$ test.

Egg white (f1)	Ovalbumin Gal d 2	Conalbumin Gal d 3	Lysozyme Gal d 4	Ovomucoid Gal d 1	Interpretation*	Management consideration
±	±	±	±	+	• Patient is at high risk to have reactions to both raw and cooked egg[1,6,7,10-14] • Probability of a persistent egg allergy[1,2,6,7,10-14]	• Egg avoidance[1,6,7,10-14] • Consider, in context of other risk factors, prescription of an adrenaline autoinjector[1,6,7,10-14] • Reassessment of egg allergic children at regular intervals is suggested to identify possible development of spontaneous tolerance[16]
±	+	±	±	−	• Indicates a risk to react to raw egg and a probability to have tolerance to cooked/baked egg, especially if Gal d 1 is negative or at low levels[1,6,7,10-14]	• Avoidance of raw egg[1,6,7,10-14] • Consider oral food challenge (OFC) with cooked/baked egg[1,6,7,10-14] • Reassessment of egg allergic children at regular intervals is suggested to identify possible development of spontaneous tolerance[16]
±	±	+	±	−		
±	±	±	+	−	• Indicates a risk to react to raw egg and a probability to have tolerance to cooked/baked egg, especially if Gal d 1 is negative or at low levels[1,6,7,10-14] • Interest to identify sensitivity to lysozyme among individuals allergic to eggs in order to specify protective measures to prevent recurrent reactions.[3-6,13]	• Avoidance of raw eggs[1,6,7,10-14] • Consider an OFC with cooked/baked egg[1,6,7,10-14] • Reassessment of egg allergic children at regular intervals is suggested to identify possible development of spontaneous tolerance[16] • Patients must be advised to carefully read the list of food and drug ingredients looking for the presence of this enzyme, taking into account that lysozyme is sometimes identified as E1105 on food labels.[3-6,15]

* Results should always be interpreted in the context of the clinical history.

References: 1. Dramburg S, et al. Pediatr Allergy Immunol 2023;34(Suppl 28):e13854 **2.** Dang TD, et al. Allergy. 2019 Feb;74(2):318-326. **3.** Everberg H, et al. Int. Arch. Allergy Immunol. 2011;154(1):33-41.**4.** Caubet J-C, et al. Curr Opin Allergy and Clin Immunol. 2011;11(3):210-5. **5.** Benedé S, et al. Int. Arch. Allergy Immunol. 2014;165(2):83-90. **6.** Weber P, et al. Mol Nutr Food Res. 2009;53(11):1469-77. **7.** Ando H, et al. J Allergy Clin Immunol. 2008;122(3):583-58 **8.** Lemon-Mulé H, et al. J Allergy and Clin Immunol 2008;122;977-983. **9.** Urisu A, et al. J Allergy Clin Immunol 1997;100:171-176.8. **10.** Benhamou Senouf AH, et al. Pediatr Allergy Immunol 2015;26:12–17 **11.** Gray CL, et al. Pediatr Allergy Immunol 2016;27:709-15.**12.** Bernhisel-Broadbent J, et al. J Allergy Clin Immunol 1994;93;1047-1059. **13.** Jarvinen KM, et al. Allergy 2007; 62:758-765. **14.** Benhamou AH, et al. Allergy 2010; 65: 283-289. **15.** Pérez-Calderón R, et al. J Investig Allergol Clin Immunol. 2007;17(4):264-6. PMID: 17694700. **16.** Santos AF, et al. Allergy. 2023 Dec;78(12):3057-3076.

Official product names: ImmunoCAP Allergen f1, Egg white; ImmunoCAP Allergen f233, Allergen component nGal d 1 Ovomucoid, Egg; ImmunoCAP Allergen f232, Allergen component nGal d 2 Ovalbumin, Egg; ImmunoCAP Allergen f323, Allergen component nGal d 3 Conalbumin, Egg; ImmunoCAP Allergen k208, Allergen component nGal d 4 Lysozyme, Egg; ImmunoCAP Allergen f75, Egg yolk

Cow's milk allergy

ImmunoCAP Specific IgE tests

ImmunoCAP Whole Allergen

Milk (f2)

ImmunoCAP Allergen Components

Bos d 8 (f78) Casein	**Bos d 4** (f76) / **Bos d 5** (f77) α-lactalbumin / β-lactoglobulin	**Bos d 6** (e204) Bovin serum albumin (BSA)
Risk of reaction to raw and cooked milk[1]	**Risk of reaction to raw milk**[1]	**Risk of reaction to raw milk and cross-reaction to beef**[7-8]
• Resistant to heat denaturation[1] • Marker of persistent milk allergy[1] • Heat and digestion stable[1] • Highly allergenic[5]	• Proteins denature once extensively heated[6*] • Abundant proteins in whey[1] • Risk for clinical reaction to raw or lightly cooked cow's milk[1]	• Minor allergen in milk and a major allergen in beef[7-8] • Cross-reacts with other serum albumins such as those from pork and sheep[7-8]

Good to know[1-4]

Up to 83% of children with milk allergy can tolerate baked milk.

Cow's milk allergen component testing can help understand the likelihood of outgrowing a milk allergy and possibility of not reacting to baked milk products.

* Recommended method of heating is to bake in the oven at 180°C for 30 min.[3,6]

Whole allergens consist of numerous allergen components. A positive whole allergen result with a negative allergen component result may mean a patient is sensitised to a component that is not yet available for testing. Consider a patient's clinical history and if an oral food challenge (OFC) with a specialist may be warranted.

Milk (f2)	α-lactalbumin Bos d 4	β-lactoglobulin Bos d 5	BSA Bos d 6	Casein Bos d 8	Interpretation*	Management consideration
					• High probability of a persistent milk allergy, • Patient is at high risk to have reactions to both raw and cooked milk[1,10–13]	• Milk avoidance[1,5,10,11,13] • Consider, in context of other risk factors, prescription of an adrenaline autoinjector [1,5,10,11,13] • Reassessment of cow's milk allergic children at regular intervals is suggested to identify possible development of spontaneous tolerance[14]
					• Indicates a risk to react to raw milk and a probability to have tolerance to cooked/ baked milk, especially if Bos d 8 is negative or at low levels[1,10–13] • More likely to outgrow/develop tolerance to cow's milk[1,10–13]	• Avoidance of raw milk[1,5,10,11,13] • Consider an OFC with cooked/baked milk[1,5,10,11,13] • Reassessment of cow's milk allergic children at regular intervals is suggested to identify possible development of spontaneous tolerance[14]
						
					• Indicates a risk to react to raw milk and a probability to have tolerance to cooked/ baked milk, especially if Bos d 8 is negative or at low levels[1,7,8,10–13] • Milk allergic patients sensitised to Bos d 6 (BSA) may have concomitant beef allergy[1,7,8,10–13]	• Avoidance of raw milk[1,5,10,11,13] • Consider an OFC with cooked/baked milk • Reassessment of cow's milk allergic children at regular intervals is suggested to identify possible development of spontaneous tolerance[14] • Consider risk of concomitant beef allergy and risk of cross-reaction with other serum albumins[1,5-8,10,11,13]

* Results should always be interpreted in the context of the clinical history.

References: 1. Dramburg S, et al. Pediatr Allergy Immunol 2023;34(Suppl 28):e13854. **2.** De Boer R, et al. J Allergy Clin Immunol Pract. 2020 Apr;8(4):1459-1461.e5. **3.** Leonard SA, et al. J Allergy Clin Immunol Pract. 2015;3(1):24. **4.** Sicherer S,H et al. Clin Exp Allergy. 1999;29(4):507-512. **5.** Shek LP, et al. Allergy. 2005;60(7):912-919. **6.** Bu G, et al. Dairy Sci. & Technol. 2013; 93:211-223 **7.** Melioli G et al. Asthma Res Pract. 2016 Jun 2;2:9. **8.** Kukkonen A K, et al. Allergy 2015;70:1239–1245. **9.** Nowak-Wegrzyn AK, et al. J Allergy Clin Immunol 2008;122(2);342-347. **10.** Caubet JC, et al. J Allergy Clin Immunol 2012;131:222-224. **11.** Ito K, et al. Clin Mol Allergy 2012 Jan 2;10(1):1. **12.** Bartuzi Z, et al. Curr Allergy Asthma Rep. 2017;17(7):46. **13.** Kleine-Tebbe J and Jakob T. Molecular Allergy Diagnostics. Innovation for a Better Patient Management. Springer 2017;12(3);291-304 **14.** Santos AF, et al. Allergy. 2023 Dec;78(12):3057-3076

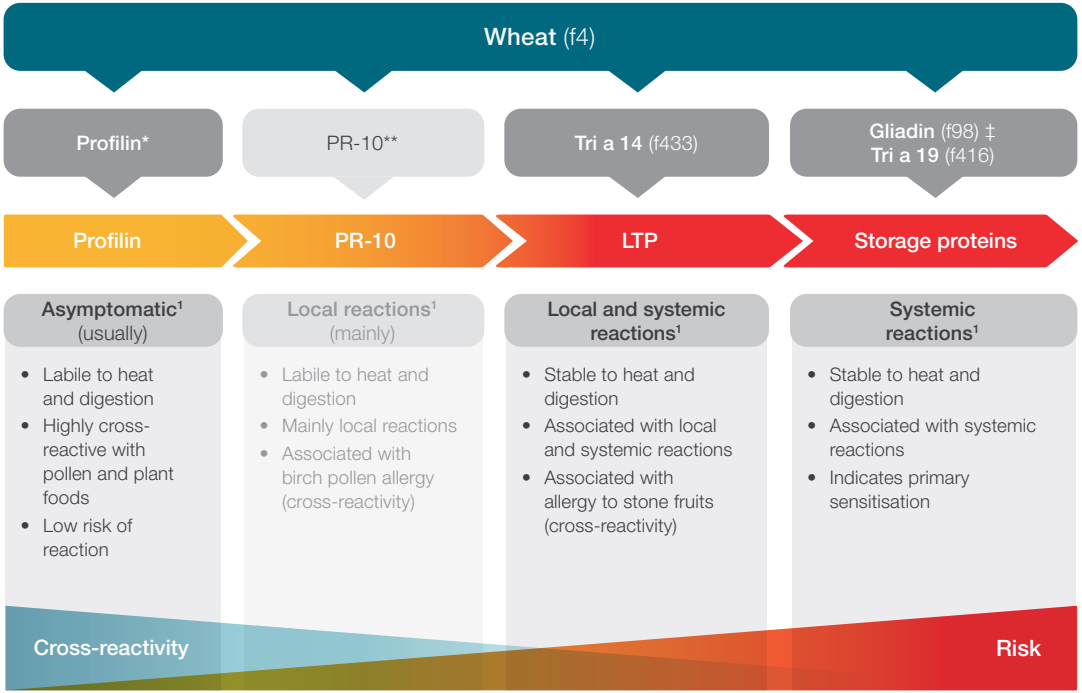
Official product names: ImmunoCAP Allergen f2, Milk; ImmunoCAP Allergen f76, Allergen component nBos d 4 Alpha-lactalbumin, Milk; ImmunoCAP Allergen f77, Allergen component nBos d 5 Beta-lactoglobulin, Milk; ImmunoCAP Allergen e204, Allergen component nBos d 6 BSA, Cow; ImmunoCAP Allergen f78, Allergen component nBos d 8 Casein, Milk

Wheat allergy

ImmunoCAP Specific IgE tests

ImmunoCAP Whole Allergen

ImmunoCAP Allergen Components



Good to know!

Up to 65% of patients who are allergic to grass pollen will have a positive wheat extract test but may not have a true wheat allergy.[2,3]

As wheat is part of the grass family, grass-allergic patients will often be sensitized to wheat due to cross-reactivity.[2,3]

* Surrogate markers for profilin: Phl p 12, Bet v 2 or Pru p 4 ** No PR-10 referenced for wheat in the WHO/IUIS ‡ Gliadin is purified from a wheat extract and consists of 4 native, highly purified (99%) gliadins: α-, β-, γ- and ω-gliadins (including ω-5 gliadin)

Wheat (f4)	Gliadin α-, β-, γ-, ω-gliadins	Tri a 19# ω-5 gliadin	LTP Tri a 14	Interpreting results*	Management considerations
+/−	+	−	+/−	**High risk of severe, systemic symptoms[4,5] Persistent primary wheat allergy is likely**	• Wheat consumption avoidance • Patient at risk of Wheat-dependent exercise induced anaphylaxis (WDEIA)[1,6] • Consider, in context of other risk factors, prescription of an adrenaline autoinjector
+/−	+/−	+	+/−	**High risk of severe, systemic symptoms[4,5] Persistent primary wheat allergy is likely**	• Wheat consumption avoidance • Higher risk of WDEIA and/or other co-factors that may increase severity of reaction (e.g. exercise, alcohol, ect.)[7] • Consider, in context of other risk factors, prescription of an adrenaline autoinjector • ω-5 gliadin* (omega-5) gives even higher specificity than gliadin (f98)[1]
+/−	−	−	+	**Risk of local and systemic reactions[8,9] Probable primary wheat allergy**	• Major allergen associated with baker's asthma • Systemic and local symptoms such as oral allergy syndrome (OAS) are possible. The patient may be sensitised to other nsLTPs contained in other plant foods/pollens due to cross-reactions which can cause systemic symptoms.
+	−	−	−	If all components of the algorithm are negative and f4 is positive, the patient could be sensitised to an untested allergen.[1]	

* Results should always be interpreted in the context of the clinical history # Omega-5-gliadin has a natural limited presence in the complete wheat extract. Therefore, if clinical suspicion persists, perform ImmunoCAP Allergen Components tests even if the whole allergen is negative.[1]

References: 1. Dramburg S, et al. Pediatr Allergy Immunol 2023;34(Suppl 28):e13854. **2.** Ricci G, et al Medicina (Kaunas) 2019 Jul 23;55(7):400. **3.** Nilsson N, et al.International Archives of Allergy and Immunology 2018;177(2):135-144. **4.** Park HJ, et al. International archives of allergy and immunology 2012;157(2):147-50. **5.** Agullo-Garcia A, et al. Rev Clin Esp 2019;219(4):184-8. **6.** Scherf KA, et al. Clin Exp Allergy 2016;46(1):10-20. **7.** Hofmann S, et al. Allergy 2012;67(11):1457-1460. **8.** Sastre J. Clin Exp Allergy 2010;40(10):1442-60. **9.** Palacin A, et al. J Allergy Clin Immunol 2007;120(5):1132-8.

Official product names: ImmunoCAP Allergen f4, Wheat; ImmunoCAP Allergen f416, Allergen component rTri a 19 Omega-5 Gliadin, Wheat; IImmunoCAP Allergen f433, Allergen component rTri a 14 LTP, Wheat

Peach allergy

ImmunoCAP Specific IgE tests

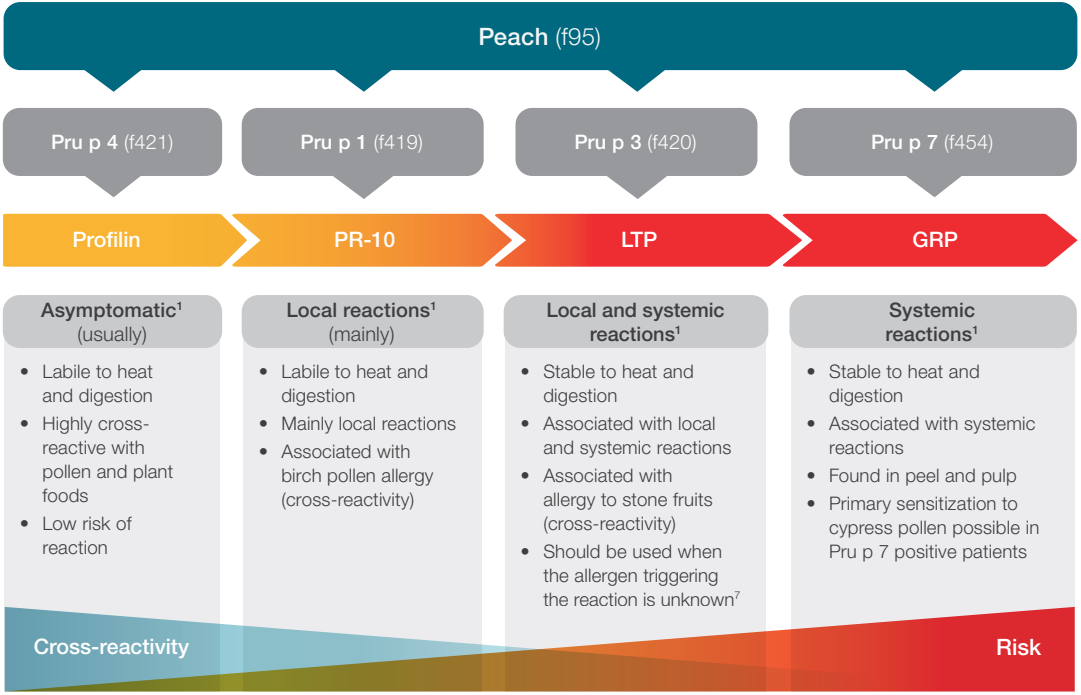
ImmunoCAP Whole Allergen

ImmunoCAP Allergen Components

Good to know!

The peach allergen Pru p 7 (gibberellin-regulated protein) is a marker for severe fruit-induced allergy and might be a link between severe allergic reactions to fruits and *Cupressaceae* pollen allergy.[1-6]

Testing for sIgE to Pru p 7 may be especially useful to fill the gap in diagnosing patients who are peach-allergic, but not sensitised to the other peach allergens Pru p 1, Pru p 3 and Pru p 4.[1-6]



Peach (f95)	Profilin Pru p 4	PR-10 Pru p 1	LTP Pru p 3	GRP Pru p 7	Interpreting results*	Management considerations
+/−	+/−	+/−	−	+	**Risk of severe, systemic symptoms** Primary sensitisation by cypress pollen possible in Pru p 7 positive patients[1-6]	• High risk of systemic reactions, especially in areas with high cypress pollen exposure • The patient may be sensitised and reacting to other GRPs contained in other fruits due to cross-reactivity. This can cause systemic symptoms to both cooked and uncooked fruit.[5] • Consider testing with cypress Whole Allergen (t23, t222) to confirm cypress sensitisation if Pru p 7 is positive.[5]
+/−	+/−	+/−	+	−	**Risk of severe, systemic symptoms** Sensitisation to five or more LTPs increase the risk of severe reactions in Pru p 3 positive patients.[1–6]	• The patient may be sensitised and reacting to nsLTPs from other plant foods/pollens due to cross-reactivity. This can cause systemic symptoms to both cooked and uncooked foods. • Consider testing for other LTPs if Pru p3 is positive.
+/−	+/−	+	−	−	**Risk of local and, in rare cases, systemic reactions**[2,3,5]	• Indication of cross-reactivity to PR-10-containing pollens and plant foods. • In regions where birch is common, consider testing with Bet v 1 (PR-10; t215) to confirm primary birch sensitisation[2,3]
+/−	+	−	−	−	**Cross-reaction, rarely associated with clinical symptoms**[2,3,5]	• Sensitisation frequently via grass pollen. May cause reactions, even severe, in a minority of patients. • Consider further investigations to identify the primary allergen.[2,3]
+	−	−	−	−	If all components of the algorithm are negative and f95 is positive, the patient could be sensitised to an untested allergen	

* Results should always be interpreted in the context of the clinical history

References: 1. Mills C, et al., editors. Plant Food Allergens: John Wiley and Sons Ltd., 2004. **2.** Dramburg S, et al. Pediatr Allergy Immunol 2023;34(Suppl 28):e13854. **3.** Kleine-Tebbe, J. and Jakob, T. 2017. Editors: Molecular Allergy Diagnostics. Springer International Publishing Switzerland. ISBN 978-3-319-42498-9 ISBN 978-3-319-42499-6 (eBook), DOI 10.1007/978-3-319-42499-6. **4.** Ehrenberg AE, et al. Clin Exp Allergy 2020;50(8);964-972. **5.** Klingebiel C, et al. Clin Exp Allergy 2019;49(4):526-536. **6.** Scala E, et al. Allergy 2015;933–943. **7.** Olivieri B, Skypala IJ. Curr Allergy Asthma Rep 2024;24(9):509-518.

Official product names: ImmunoCAP Allergen f95, Peach; ImmunoCAP Allergen f419, Allergen component rPru p 1 PR-10, Peach; ImmunoCAP Allergen f420, Allergen component rPru p 3 LTP, Peach; ImmunoCAP Allergen f421, Allergen component rPru p4 Profilin, Peach; ImmunoCAP Allergen f454, Allergen component rPru p 7 Peach; ImmunoCAP Allergen t215, Allergen component rBet v 1 PR-10, Birch; ImmunoCAP Allergen t23, Italian/Mediterranean/Funeral cypress; ImmunoCAP Allergen t222, Arizona cypress.

Fish allergy

ImmunoCAP Specific IgE tests

The increase in global fish consumption has led to an increase in reports of fish-related allergies.[1] The route of exposure is not limited to ingestion, but also includes manual handling and inhalation, which are important factors to consider in occupational exposure.[1]

ImmunoCAP Whole Allergens

Cod (f3) **/ Salmon** (f41)

ImmunoCAP Allergen Components

Gad c 1 (f426) **and/or Cyp c 1** (f355)
Parvalbumins

Major allergens

- Major fish allergens
- Specific marker allergen of genuine sensitization to fish
- Stable to heat and digestion
- Important clinical cross-reactivity among fish species
- Abundant in bony fish light muscle, but present in very low amounts in dark muscle[1-6]

Regular consumption of fish or recent exposure without symptoms: *Anisakis simplex,* a parasite residing in fish muscle, can be another source of IgE-mediated hypersensity after fish ingestion[7]

Good to know!

Parvalbumins are major allergens in fish and causes a major clinical cross reactivity between fish species.[1-6]

However, they are expressed in lower levels in certain fish species such as salmon, halibut and tuna. This perhaps explains why some fish-allergic patients can tolerate these species.[1,6]

Cod (f3) **Salmon** (f41)	**Paravalbumin** Gad c 1	**Paravalbumin** Cyp c 1	**Interpreting results and management considerations***
+/−	+	+/−	• Primary allergen in fish, high probability of allergy to cod and closely related fish (white fish but also other fishes) due to cross-reactions[1–7] • Consider cod and closely related fish avoidance
+/−	+/−	+	• High probability of allergy to carp and closely related fish (oily fish) due to cross-reactions[1–7] • Consider carp and closely related fish avoidance
+	−	−	• If all components in the algorithm are negative and fish extracts are positive, the patient might be sensitized to an untested allergen like enolase and/or aldolase. As such, in the context of clinical history, exposure reduction may still be recommended.[7] If clinical suspicion persists, consider oral food challenge (OFC).[1]

* Results should always be interpreted in the context of the clinical history.

As cross-reactivity between fish species can be limited, consider other available ImmunoCAP whole allergens available for testing:

Whole allergen	Code
Anchovy	f313
Catfish	f369
Chub mackerel	f50
Fish (cod)	f3
Gulf flounder	f147
Haddock	f42
Hake	f307

Whole allergen	Code
Halibut	f303
Herring	f205
Jack mackerel, Scad	f60
Mackerel	f206
Megrim	f311
Plaice	f254
Pollock	f413

Whole allergen	Code
Red snapper	f381
Salmon	f41
Sardine (Pilchard)	f61
Sole	f337
Swordfish	f312
Tilapia	f414
Trout	f204

References: 1. Leung ASY et al. J Allergy Clin Immunol Pract. 2024 Mar;12(3):633-642.e9. **2.** Swoboda I, et al. Allergy 2002;57:(Suppl 73):79-84. **3.** Bugajska-Schretter A, et al. J Allergy Clin Immunol 1998;101:67–74. **4.** Lim DL-C, et al. Allergy Immunol 2008;19:399–407. **5.** Bugajska-Schretter A, et al. Gut 2000;46(5):661-669. **6.** Griesmeier U, et al. Allergy 2010;65:191-198. **7.** Dramburg S, et al. Pediatr Allergy Immunol 2023;34(Suppl 28):e13854.

Official product names: ImmunoCAP Allergen f3, Fish (cod); ImmunoCAP Allergen f426, Allergen component Gad c1 Cod; ImmunoCAP Allergen f307, Hake; ImmunoCAP Allergen f205 Herring; ImmunoCAP Allergen f60 Jack mackerel; ImmunoCAP Allergen f206 Mackerel; ImmunoCAP Allergen f311, Megrim; ImmunoCAP Allergen f254 Plaice; ImmunoCAP Allergen f413, Pollock; ImmunoCAP Allergen f381 Red snapper; ImmunoCAP Allergen f41 Salmon; ImmunoCAP Allergen f308 Sardine; ImmunoCAP Allergen f61 Sardine, Japanese Pilchard; ImmunoCAP Allergen f337 Sole; ImmunoCAP Allergen f312 Swordfish; ImmunoCAP Allergen f414 Tilapia; ImmunoCAP Allergen f204 Trout; ImmunoCAP Allergen f40 Tuna; ImmunoCAP Allergen f355, Allergen component rCyp c 1 Carp; ImmunoCAP Allergen f384, Whitefish (Inconnu)

Shellfish and crustaceans allergy

ImmunoCAP Specific IgE tests

The shellfish group is included among the “Big Eight” food groups which are responsible for more than 90% of all food allergy cases. It is estimated that up to 3% of the adult population is affected by food allergy to shellfish, including crustaceans and molluscs, depending on geographical region.[1,2]

ImmunoCAP Whole Allergen

Shrimp (f24)

ImmunoCAP Allergen Components

Pen a 1 (f351) / **Pen m 1***
Tropomyosins

Primary sensitiser

- Pen a 1 from *Penaeus aztecus*
- Pen m 1 from *Penaeus monodon*
- Major and clinically relevant allergens in shrimp and crustacean allergy
- Thermostable and highly allergenic proteins
- Tropomyosin proteins are highly cross-reactive amongst many invertebrate species (pan-allergen) such as shrimps and other crustacean foods such as crab, lobster, snail and molluscs as well as dust mites, cockroaches and helminths[3-6]

Minor allergens

Pen m 2*
Arginine kinase

Pen m 4*
Sarcoplasmic calcium binding protein

- Minor allergens from *Penaeus monodon*
- Possible relevance for the diagnosis of respiratory allergies in the occupational setting where sensitisation results from inhalation exposure

Good to know!

Prevalence of dust mite-allergic patients with IgE to tropomyosin is reportedly between 5–18%.[7] Patients with sIgE to Der p 10 may have a higher probabiity of allergic reactions to shellfish (crustaceans and molluscs), insects and parasites.[5]

* Available only on ImmunoCAP ISAC$_{E112i}$ test

Shrimp (f24)	Tropomyosin Pen a 1	Tropomyosin Der p 10	Interpreting results and management considerations*
+/−	+	+/−	Probability to react to different tropomyosin and to crustacean foods in general – cross-reactions through tropomyosin can cause systemic symptoms.[3,5-7]
+/−	+/−	+	Some patients sensitised to Der p 10 may react to crustacean tropomyosin such as Pen a 1 in shrimp. These patients are at higher probability of crustacean allergy.[3,5-7]
+	−	−	If all components in the algorithm are negative and f24 is positive, the patient might be sensitized to an untested allergen. As such, in the context of clinical history, exposure reduction may still be recommended.[8]

*Results should always be interpreted in the context of the clinical history.

ImmunoCAP whole allergens available for testing:

Whole allergen	Code
Shrimp	f24
Abalone	f346
Blue mussel	f37
Clam	f207
Crab	f23
Crayfish	f320
Langust (spiny lobster)	f304

Whole allergen	Code
Lobster	f80
Octopus	f59
Oyster	f290
Pacific squid	f58
Snail	f314
Squid	f258
Scallop	f338

References: 1. Davis CM, et al. J Allergy Clin Immunol Pract 2020;8(1):37-44. **2.** Ruethers T, et al.Mol Immunol 2018;100:28-57. **3.** Turner P, et al. Ann Allergy Asthma Immunol 2011;106(6):494-501. **4.** Chokshi NY, et al. Allergy Asthma 2015;36(4):65-71. **5.** DeWitt AM, et al. Mol Nutr Food Res 2004;48(5):370-379. **6.** Fernandes J. Clin Exp Allergy 2003;33:956. **7.** Ayuso R, et al. J Allergy Clin Immunol 2008;122:795-802. **8.** Dramburg S, et al. Pediatr Allergy Immunol 2023;34(Suppl 28):e13854.

Official product names: ImmunoCAP Allergen f24, Shrimp; ImmunoCAP Allergen f346, Abalone; ImmunoCAP Allergen f37 Blue mussel; ImmunoCAP Allergen f207, Clam; ImmunoCAP Allergen f23, Crab; ImmunoCAP Allergen f320, Crayfish; ImmunoCAP Allergen f304, Langust; ImmunoCAP Allergen f80, Lobster; ImmunoCAP Allergen f59, Octopus; ImmunoCAP Allergen f290; ImmunoCAP Allergen f58, Pacific squid; ImmunoCAP Allergen f314, Snail; ImmunoCAP Allergen f258, Squid; ImmunoCAP Allergen f338, Scallop; ImmunoCAP Allergen f351, Allergen component rPen a 1 Tropomyosin, Shrimp; ImmunoCAP Allergen d205, Allergen component rDer p 10 Tropomyosin, House dust mite

Venom Hymenoptera allergy

ImmunoCAP Specific IgE tests

The Hymenoptera order comprises more than 100,000 known species of insects worldwide.[1] Some components of Hymenoptera venom are potential allergens and can cause local and systemic allergic reactions after IgE-mediated sensitisation.[1] Hymenoptera stings cause 48% of severe anaphylactic reactions occurring in European adults, and 20% of those occurring in children.[2] If there is a history of a general allergic reaction after a Hymenoptera sting, allergy testing including determination of specific IgE antibodies against bee and/or vespula venom/components, shall be performed.[1,3,4]

ImmunoCAP Whole Allergens

Honey bee (i1) + **common wasp** (i3) + **paper wasp** (i77)

ImmunoCAP™ Tryptase test#

ImmunoCAP Allergen Components*

Honey bee: **rApi m 1** (i208), **rApi m 2** (i214), **rApi m 3** (i215), **rApi m 5** (i216), **rApi m 10** (i217)
Common/paper wasp: **rVes v 1** (i211), **rVes v 5** (i209), **rPol d 5** (i210)

Positive to one or more of rApi m 1, 2, 3, 5 and 10 but **negative** to both rVes v 1 and rVes v 5

Positive to one or more of rApi m 1, 2, 3, 5 and 10 and **positive** to rVes v 1 and/or rVes v 5 and/or rPol d 5

Positive to one or more of rVes v 1, rVes v5 and rPol d 5 but **negative** to all of rApi m 1, 2, 3, 5 and 10

Venom immunotherapy (VIT)

Honey bee

Honey bee + common/paper wasp

Common/paper wasp

* Results should always be interpreted in the context of the clinical history. # Measuring basal tryptase levels before AIT can help to evaluate the risk of severe reaction.[3,4]

References: 1. Rueff F, et al. Allergologie select 2023;Vol.7(154-190). **2.** Dramburg S, et al. Pediatr Allergy Immunol 2023;34(Suppl 28):e13854. **3.** Bilò et al. Allergy 2005;60:1339–1349. **4.** Rieger-Ziegler, et al. Int Arch Allergy Immunol 1999;120:166–1685. **5.** Rueff F, et al. J Allergy Clin Immunol 2009. **6.** Abrams EM, Allergy. Med Clin North Am 2020. **7.** Barber D, et al Allergy 2021;00:1–17. **8.** Jin C, et al. J Allergy Clin Immunol 2010. **9.** Kohler J, et al. J Allergy Clin Immunol 2014. **10.** Spillner E, et al. Front Immunol 2014. **11.** Jakob T, et al. Curr Allergy Asthma Rep 2020. **12.** Blank, S. et al. Allergy 2011; 66:1322-1329. **13.** Bohle B, et al. Clin Exp Allergy 2005. **Official product names:** ImmunoCAP Allergen i1, Honey bee venom; ImmunoCAP Allergen i3, Common wasp venom (Yellow jacket); ImmunoCAP Allergen i77, European paper wasp venom; ImmunoCAP Allergen i208, Allergen component rApi m 1 Phospolipase A2, Honey bee; ImmunoCAP Allergen i214, Allergen component rApi m 2, Honey bee; ImmunoCAP Allergen i215, Allergen component rApi m 3, Honey bee; ImmunoCAP Allergen i216, Allergen component rApi m 5, Honey bee; ImmunoCAP Allergen i217, Allergen component rApi m 10, Honey bee; ImmunoCAP Allergen i211, Allergen component rVes v 1 Phospholipase A1, Common wasp; ImmunoCAP Allergen i209, Allergen component rVes v 5 Common wasp; ImmunoCAP Allergen i210, Allergen component rPol d 5 European Paper wasp; ImmunoCAP Allergen o214, Allergen component MUXF3 CCD, Bromelain;

Allergen	Description
ImmunoCAP Whole extract	
Honey bee (i1) *Apis mellifera*	
ImmunoCAP Allergen components	
Api m 1 (i208) **Phospholipase A2**	• Major allergen and marker of genuine sensitisation to honey bee venom, supporting the choice of honeybee VIT in eligible patients[2] • Allows discrimination between honey bee and yellow jacket/paper wasp venom sensitisation[2]
Api m 2 (i214) **Hyaluronidase**	• Major honey bee allergen[2] • Limited cross-reactivity with other hyaluronidase Ves v 2 and Pol d 2 in absence of CCDs[2,7]
Api m 3 (i215) **Acid phosphatase**	• Major allergen and marker of genuine sensitisation to honey bee venom[2] • Particularly valuable in Api m 1-negative patients[2] • Might be underrepresented in honeybee therapeutic extracts for VIT[9]
Api m 5 (i216) **Dipeptidyl peptidase**	• Major honey bee allergen[2] • Exhibits cross-reactivity with homologous vespid venom allergens[2,10]
Api m 10 (i217) **Icarapin**	• Major allergen and marker of genuine sensitisation to honey bee venom[2] • Particularly valuable in Api m 1-negative patients[2] • Underrepresented in honey bee extracts, negatively affecting the outcome of VIT in allergic patients with dominant Api m 10 sensitisation[11,12]

Allergen	Description
ImmunoCAP Whole extract	
Common wasp (i3) *Vespula vulgaris*	
ImmunoCAP Allergen components	
Ves v 1 (i211) **Phospholipase A1**	• Major allergens and markers of genuine sensitisation to common wasp[2] • Diagnostic sensitivity of a combination of the recombinant allergens Ves v 5 and Ves v 1 is very high[2]
Ves v 5 (i209) **Antigen 5**	• Allow discrimination between honeybee and vespid venom sensitisation in double-sensitised patients[2] • PLA1 and antigen 5 have been described as relevant venom allergens also in hornets[2]

Allergen	Description
ImmunoCAP Whole extract	
Paper wasp (i77) *Polistes dominulus*	
ImmunoCAP Allergen components	
Pol d 5 (i210) **Antigen 5**	• Major allergens and markers of genuine sensitisation to *Vespidae* venom, in particularly to paper wasp[2,13]

Note: The allergen component CCD carbohydrate determinant MUXF3 (o214) is available to clarify double positivity due to CCD cross-reactions. The recombinant insect venom components do not contain CCDs.

Latex allergy

ImmunoCAP Specific IgE tests

Latex allergy is one of the significant allergies associated with occupational exposure and groups at higher risk may include health care workers (HCW), children with spina bifida and individuals with multiple surgeries. Latex allergy can trigger contact urticaria but also severe and even life-threatening allergic reactions.[1-2]

ImmunoCAP Whole Allergen

Latex (k82)

ImmunoCAP Allergen Components

Hev b 1 (k215)
Rubber elongation factor

Hev b 3 (k217)
Small rubber particle protein

Hev b 5 (k218)
Acidic structural protein

Hev b 6.02 (k220)
Prohevein

Primary sensitisers

- Major and specific latex allergens[3-4]
- Indicators of primary sensitisation to latex[3-4]
- Hev b 1 and Hev b 3 are major allergens in children with spina bifida[5]

- Specific latex allergens[1,2,6,7]
- Indicator of primary sensitisation to latex[1,2,6,7]
- Hev b 5 is a major allergen among HCW and important in spina bifida patients[5]
- Hev b 6 is associated with latex-food allergy, e.g.cross reaction with banana, avocado, kiwi and chestnut[1,2,6,7] and is a major allergen in HCW[1,5]

Hev b 11 (k224)
Class 1 chitinase

Hev b 8 (k221)
Profilin

CCD (0214)
MUXF3 from Bromelain

Cross-reactive allergens / others

- Minor allergens[1]
- Hev b 11 is associated with latex-food allergy, e.g. cross-reaction with banana, avocado, kiwi and chestnut[1,2,6,7]
- Hev b 8 is a profilin (panallergen), seldom of clinical importance[1]
- Latex positivity (k82) can also be explained by IgE antibodies against cross-reactive carbohydrate determinants (CCD) and can be detected with MUFX3

Good to know!

It has been reported that 30% to 50% of latex-allergic patients present with syndrome derived as **"Latex-fruit",** which is a cross-reactivity observed between latex and fresh fruits.[1,9]

The fruits and vegetables most commonly associated with this syndrome include avocado, banana, chestnut, and kiwi.[1,9]

ImmunoCAP Whole allergen	Latex (k82)						
ImmunoCAP Allergen components	Primary allergens				Cross-reactive allergens		Other
	Hev b 1 (k215)	Hev b 3 (k217)	Hev b 5 (k218)	Hev b 6.02 (k220)	Hev b 11 (k224)	Hev b 8 (k221)	MUXF3 (CCD)* (o214)
Positive results and relevant latex allergy	**Likely** Associated with severe reaction during surgery[3,4]		**Likely** Associated with urticaria, angioedema, rhinitis, asthma[1,3,6,7]		**Unlikely** Associated with oral allergy syndrome (OAS), rhinoconjuctivitis, angioedema[8–11]		**Unlikely** Associated with low or no clinical relevance
Patient management	Latex avoidance		Latex avoidance Information on latex/cross-reactivity to plant foods		Latex avoidance not nessessary** Info on cross-reactivity to plant foods/profilin		No impact

Results should always be interpreted in the context of the clinical history. * Latex positivity (k82) can also be explained by IgE antibodies against cross-reactive carbohydrate determinants (CCD) and can be detected with MUFX3 ** with precaution

References: 1. Dramburg S, et al. Pediatr Allergy Immunol 2023;34(Suppl 28):e13854. **2.** Parisi CAS, et al. World Allergy Organ J 2021;14(8):100569. **3.** Wagner B, et al. J Allergy Clin Immunol 2001;108(4):621-627. **4.** Kleine-Tebbe J, et al. 2017. Editors: Molecular Allergy Diagnostics. Springer International Publishing Switzerland. **5.** Caballero ML, et al Expert review of clinical immunology 2015;11(9):977-992. **6.** Raulf-Heimsoth M, et al. Allergy 2004;59(7):724-733. **7.** Vandenplas O, et al. Allergy 2016;71:840– 849. **8.** Ebo DG, et al. Clin Exp Allergy 2010;40(2):348-358. **9.** Schuler S, et al. Clin Transl Allerg 2013;3(1):11. **10.** Ott H, et al. J Investig Allergol Clin Immunol 2010;20(2):129-138. **11.** Garnier L, et al. Eur Ann Allergy Clin Immunol 2012;44(2):73–79.

Official product names: ImmunoCAP Allergen k82, Latex; ImmunoCAP Rare Allergen k215, Allergen component rHev b 1 Latex; ImmunoCAP Rare Allergen k217, Allergen component rHev b 3 Latex; ImmunoCAP Allergen k218, Allergen component rHev b 5 Latex; ImmunoCAP Rare Allergen k220, Allergen component rHev b 6.02 Latex; ImmunoCAP Rare Allergen k221, Allergen component rHev b 8 Profilin, Latex; ImmunoCAP Rare Allergen k224, Allergen component rHev b II Latex; ImmunoCAP Allergen o214, Allergen component MUXF3 CCD, Bromelain

ImmunoCAP™ Tryptase test

In case of a suspected systemic allergic reaction

Tryptase is a useful biomarker in investigation of systemic allergic reaction, as it is released into the circulation during anaphylaxis.[1-5]

Acute systemic (anaphylactic) reaction

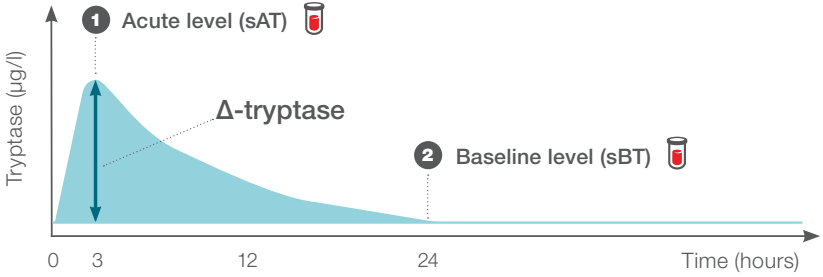
Two serum samples: acute (sAT) and baseline tryptase level (sBT)

30 minutes to 4 hours after the reaction* (peak level)[3]

At least 24 hours after complete resolution of all clinical symptoms (baseline level)[2,3]

Delta-tryptase (Δ-tryptase) (sAT - sBT) ≥ 20% of the individual's sBT + 2 µg/l

Mast cell activation is confirmed[6–8]



In case of a suspected systemic allergic reaction, measure tryptase levels twice.

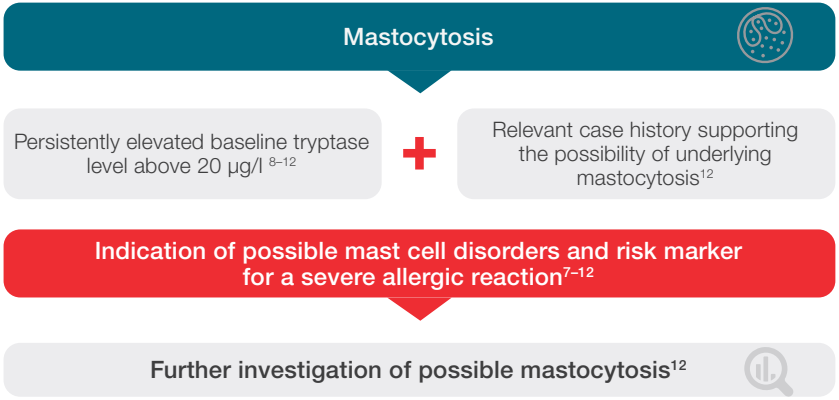
* EAACI recommends a tighter time frame of 30 min to 2 hours, based on the same references[2]

ImmunoCAP Tryptase test

In case of suspected mastocytosis

Mastocytosis is a rare disease characterized by increased numbers of mast cells in different organs.[7] There are different forms of mastocytosis, such as systemic mastocytosis (SM) and cutaneous mastocytosis (CM). Measuring serum tryptase can help to distinguish whether the reaction is due to mast cell activation or whether the cause is non-immunological.[7] A persistently elevated baseline serum tryptase level above 20 µg/l* is one **minor diagnostic criterion** established by **The World Health Organization (WHO)** for the classification of SM.[8–10]

* When hereditary α-tryptasemia is diagnosed, the BST level should be adjusted.



Product information for sample preparation and storage[3]

- **Calibrator range:** 1-200µg/l
- **Volume needed:** 40µl
- **Specimen collection:** Both serum and plasma samples from venous blood can be used
- **Preparation of sample:** No need for special procedures when collecting blood or preparing the sample

Stability:

- 48h at room temperature
- 1 week at +2–8°C
- 1 year at -20°C

References: 1. Rueff F, et al. Allergologie select 2023;Vol.7(154-190). **2.** Muraro, et al. Anaphylaxis (2021 update) Allergy. 2022 Feb;77(2):357-377. **3.** ImmunoCAP™ Tryptase Directions for use 2024;52-5467-EN/06. **4.** Lieberman, et al. J Allergy Clin Immunol 2010;126(3):477-80.e1-42. **5.** Liang L, et al. Yonsei Med J. 2022 Feb;66(2):75-86. **6.** Vitte, et al. J Allergy Clin Immunol Aug 2021;9(8):2994-3005. **7.** Schwartz LB, Immunol Allergy Clin N Am 2006 Aug;26(3):451-63. **8.** Cardona, et al. World Allergy Organ J 2020 Oct 30;13(10):100472. **9.** Simons FE, et al. World Allergy Organ J 2014 Oct 28;8(1):32. **10.** Horny HP, et al. IARC 2011 Dec 28;129(11):1420–1427. **11.** Valent P, et al. Blood. 2017 Mar 16;129(11):1420-1427. **12.** Swerdlow, et al. WHO Classification of Tumours of Haematopoietic and Lymphoid Tissues WHO Classification of Tumours, 4th Edition, Volume 2, 2008. **Official product names:** ImmunoCAP Tryptase Anti-Tryptase

Ratio analysis

The power of ratio analysis is also supported by INTEGRA publication[1]

Clinical suspicion

- Respiratory allergy
- Allergy to Hymenoptera venom
- Food allergy
- Anaphylaxis

Initial diagnosis

Medical history + physical examination + other complementary tests

Personalised diagnosis of allergy

Diagnostic orientation skin prick test / sIgE / intradermal test[2]

Determination of IgE, 3 levels

tIgE / we-sIgE / c-sIgE*

If we-sIgE clearly lower than tIgE	If we-sIgE / tIgE relevant and suggestive symptoms	If c-sIgE clearly lower than we-sIgE	If c-sIgE / we-sIgE relevant and suggestive symptoms
Other allergens involved[1]	Clinical symptoms caused by whole allergen[1]	Other components involved[1]	Clinical symptoms caused by component

* tIgE: total serum immunoglobulin E, we-sIgE: whole extract serum specific IgE, c-sIgE: allergen molecule serum specific IgE ("c" stands for "component")

How to include ratios in clinical practice?

Authors recommendations (Delphi validated)[1]

Ratio 1 $\frac{\text{we-sIgE}}{\text{tIgE}}$	
What to do?	Determine **ratio 1** before clinical decision-making.
Why?	To evaluate of the extent sensitisation attributable to whole extract, before clinical decision.

Ratio 2 $\frac{\text{c-sIgE}}{\text{we-sIgE}}$	
What to do?	Determine **ratio 2** before clinical decision-making
Why?	To determine the involvement of a given allergic component, especially minor allergens

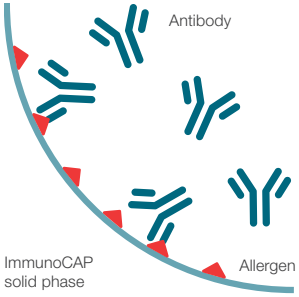
How?	Using the same sIgE determination platform in both measurements

Good to know!

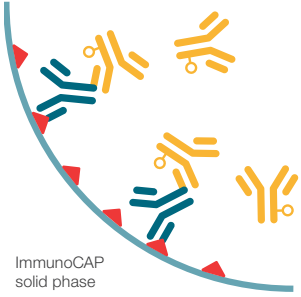
The Delphi method entails use of a group technique that aims to obtain the most valid and reliable consensus from the panel of skillful and knowledgeable individuals by using a series of questionnaires. Delphi studies have been used in educational settings in predicting trends, standards and in forming guidelines.[3,4]

References: 1. Pascal M, et al. Integration of in vitro allergy test results and ratio analysis for the diagnosis and treatment of allergic patients (INTEGRA). Clin Transl Allergy 2021;e12052. **2.** Santos AF, et al. EAACI guidelines on the diagnosis of IgE-mediated food allergy 2023;78:3057-3076. **3.** Dalkey, N, et al. Management Science 1963;vol. 9, no. 3, 458–467 **4.** Green R. Sage Open 2014.

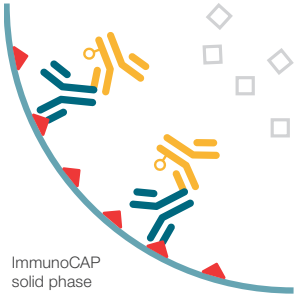
ImmunoCAP test principles



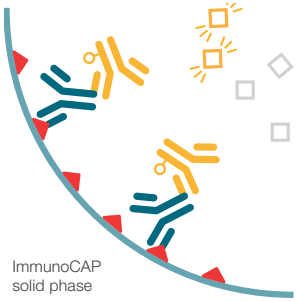
❶ The allergen bound to the solid phase reacts with the specific IgE in the patient sample.



❷ After washing away non-specific IgE, enzyme-labelled antibodies against IgE are added to form a complex.



❸ After incubation, unbound enzyme-labelled anti-IgE is washed away and the bound complex is then incubated with a developing agent.



❹ Adding a stop solution (not shown) inhibits the enzymatic reaction so that the fluorescence can be determined. The fluorescence measured correlates with the concentration of specific IgE antibodies in the patient sample within a defined measuring range.

- The ImmunoCAP test is a fluorescence enzyme immunoassay (FEIA) based on an indirect enzyme-linked immunosorbent assay (ELISA).

- Solid phase are coated with one or several target allergens, which specific IgE antibodies recognise and bind to. Such antibodies are usually specific markers for certain allergic diseases. Different coupling and coating processes are used for each of the specific tests to ensure an accurate presentation of the relevant epitopes.

- If the patient's sample contains the relevant IgE specific antibodies, these will bind to the corresponding target allergen in the solid phase. Following the first washing step, in which non-bound antibodies are removed, enzyme-conjugated secondary antibodies specifically bind to the Fc region of the IgE antibody. After a second washing step, in which excess secondary antibodies are removed, a reagent is added to the allergen-antibody complex. This reagent is converted to a fluorescent substrate through an enzymatic reaction. After a set incubation time, the enzymatic reaction is aborted using a stop solution, and the fluorescence is measured with a fluorescence detector in the Phadia™ Laboratory System.

- The concentration of antibodies in the patient sample is determined using the previously prepared, standardised calibration curve. This produces a quantitative result and a classification as negative or positive.

Good to know!

The unique, high-capacity solid phase of the ImmunoCAP well facilitates access presence of allergen epitopes. This makes it possible to detect extremely low serum concentrations of specific IgE, avoiding interference from other classes of immunoglobulins present.[1,2]

1. L Sevéus and A Sandell, 1992
2. Hemmer W, j.jaci.2017.04.028

Access our digital resources

Click links or scan QR codes

thermofisher.com/immunocap

Product catalogue

Allergen encyclopedia

Newsletter registration

Clinical education webinar library

eDFU portal

allergyinsider.com

Allergy Insider provides patients with helpful information to better understand allergic symptoms and learn more about possible triggers or available testing options.

Allergy Insider expands the patients' knowledge about allergies on social media as well.

ImmunoCAP allergen components

Product*		Code	Allergen family	Art. No.	Barcode
Grass pollen					
nCyn d 1, Bermuda grass	*Cynodon dactylon*	g216	Grass group 1	14-4972-01	CFA
rPhl p 1, Timothy	*Phleum pratense*	g205	Grass group 1	14-5234-01	BSU
rPhl p 2, Timothy	*Phleum pratense*	g206	Grass group 2	14-5235-01	C0K
nPhl p 4, Timothy	*Phleum pratense*	g208		14-5288-01	C0L
rPhl p 6, Timothy	*Phleum pratense*	g209		14-5289-01	BSV
rPhl p 7, Timothy	*Phleum pratense*	g210	Polcalcin	14-5290-01	BSW
rPhl p 11, Timothy	*Phleum pratense*	g211		14-5291-01	BSX
rPhl p 12, Timothy, Profilin	*Phleum pratense*	g212	Profilin	14-5292-01	BSY
rPhl p 5b, Timothy	*Phleum pratense*	g215	Grass group 5	14-5338-01	BV3
rPhl p 1, rPhl p 5b, Timonthy	*Phleum pratense*	g213		14-5312-01	BU1
rPhl p 7, rPhl p 12, Timonthy	*Phleum pratense*	g214		14-5313-01	BU2
Weed pollen					
nAmb a 1, Ragweed	*Ambrosia elatior*	w230		14-4969-01	CF8
nArt v 1, Mugwort	*Artemisia vulgaris*	w231		14-4970-01	CF9
nArt v 3, Mugwort, LTP	*Artemisia vulgaris*	w233		14-4983-01	CJ2
rPar j 2, Wall pellitory, LTP	*Parietaria judaica*	w211	Lipid transfer protein (nsLTP)	14-5311-01	C2M
nPla l 1, Plantain (English)	*Plantago lanceolata*	w234		14-5751-01	D1H
nSal k 1, Saltwort	*Salsola kali*	w232		14-4978-01	CFE
Tree pollen					
rBet v 1, Birch, PR-10	*Betula verrucosa*	t215	PR-10 protein	14-5225-01	BPV
rBet v 2, Birch, Profilin	*Betula verrucosa*	t216	Profilin	14-5226-01	BR1

Product*		Code	Allergen family	Art. No.	Barcode
rBet v 4, Birch	*Betula verrucosa*	t220	Polcalcin	14-5287-01	BT7
rBet v 6, Birch	*Betula verrucosa*	t225		14-5345-01	CF1
rBet v 2, rBet v 4, Birch	*Betula verrucosa*	t221		14-5310-01	BU0
nCup a 1, Cypress	*Cupressus arizonica*	t226		14-4977-01	CFD
rOle e 1, Olive	*Olea europaea*	t224		14-5705-01	CTC
nOle e 7, Olive	*Olea europaea*	t227	Lipid transfer protein (nsLTP)	14-4993-01	CKT
rOle e 9, Olive	*Olea europaea*	t240		14-4999-01	CTZ
rPla a 1, Plane tree	*Platanus acerifolia*	t241		14-5957-01	D2H
Microorganisms					
rAlt a 1	*Alternaria alternata*	m229		14-5346-01	CE0
rAsp f 1	*Aspergillus fumigatus*	m218		14-5293-01	BPL
rAsp f 2	*Aspergillus fumigatus*	m219		14-5294-01	BPM
rAsp f 3	*Aspergillus fumigatus*	m220		14-5295-01	BT4
rAsp f 4	*Aspergillus fumigatus*	m221		14-5296-01	BPN
rAsp f 6	*Aspergillus fumigatus*	m222	Mn superoxide dismutase	14-5297-01	BPP
Animals – epidermals and proteins					
nBos d 6, Cow , BSA	*Bos domesticus*	e204		14-5009-01	BRV
rCan f 1, Dog	*Canis familiaris*	e101	Lipocalin	14-4955-01	CBN
rCan f 2, Dog	*Canis familiaris*	e102	Lipocalin	14-4956-01	CBP
nCan f 3, Dog, Serum albumin	*Canis familiaris*	e221	Serum albumin	14-5241-01	C14
rCan f 4, Dog	*Canis familiaris*	e229	Lipocalin	14-5755-01	CZY
rCan f 5, Dog	*Canis familiaris*	e226	Arginine esterase	14-4998-01	CMZ
rCan f 6, Dog	*Canis familiaris*	e230	Lipocalin	14-6081-01	E2X

* Letters preceding the common name denote the raw material source: n=native or r=recombinant.

Product*		Code	Allergen family	Art. No.	Barcode
rFel d 1, Cat	*Felis domesticus*	e94	Uteroglobin	14-4905-01	BY0
rFel d 2, Cat, Serum albumin	*Felis domesticus*	e220	Serum albumin	14-5240-01	BRX
rFel d 4, Cat	*Felis domesticus*	e228	Lipocalin	14-5702-01	CT9
rFel d 7, Cat	*Felis domesticus*	e231	Lipocalin	14-6082-01	E2Y
rEqu c 1, Horse	*Equus caballus*	e227	Lipocalin	14-5700-01	CN7
nSus s, Porcine serum albumin, Swine	*Sus scrofa*	e222	Serum albumin	14-5242-01	C36
Mites					
rDer p 1, House dust mite	*Dermatophagoides Pteronyssinus*	d202		14-5996-01	CFG
rDer p 2, House dust mite	*Dermatophagoides Pteronyssinus*	d203		14-4967-01	CG2
rDer p 10, House dust mite, Tropomyosin	*Dermatophagoides Pteronyssinus*	d205	Tropomyosin	14-4985-01	CG5
rDer p 23, House dust mite	*Dermatophagoides Pteronyssinus*	d209	Peritrophin-like protein	14-6040-01	DWU
Insects – venom					
rApi m 1, Phospholipase A2, Honey bee	*Apis mellifera*	i208	Phospholipase A1	14-4987-01	CJ7
rApi m 2, Hyaluronidase, Honey bee	*Apis mellifera*	i214	Hyaluronidase	14-6014-01	DUD
rApi m 3, Acid phosphatase, Honey bee	*Apis mellifera*	i215	Acid phosphatase	14-6015-01	DUC
rApi m 5, Dipeptidyl peptidase, Honey bee	*Apis mellifera*	i216	Dipeptidyl peptidase	14-6016-01	DUB
rApi m 10, Icarapin, Honey bee	*Apis mellifera*	i217	Icarapin	14-6004-01	DR0
rVes v 1, Phospholipase A1, Common wasp	*Vespula vulgaris*	i211	Phospholipase A1	14-4995-01	CMR
rVes v 5, Common wasp	*Vespula vulgaris*	i209	Antigen 5	14-4992-01	CJ8
rPol d 5, European Paper wasp	*Polistes dominulus*	i210	Antigen 5	14-4994-01	CJ9
Occupational					
rHev b 1, Latex	*Hevea brasiliensis*	k215		14-5324-01	C20
rHev b 3, Latex	*Hevea brasiliensis*	k217		14-5326-01	C2A
rHev b 5, Latex	*Hevea brasiliensis*	k218		14-5327-01	C1Z
rHev b 6.02, Latex	*Hevea brasiliensis*	k220		14-5329-01	C22

Product*		Code	Allergen family	Art. No.	Barcode
rHev b 8, Latex, Profilin	*Hevea brasiliensis*	k221	Profilin	14-5330-01	C1V
rHev b 11, Latex	*Hevea brasiliensis*	k224		14-5333-01	C29
Occupational – enzymes					
nAna c 2, Bromelain, Pineapple	*Ananas comosus*	k202		14-5127-01	BT1
nAsp o 21, Alpha-amylase, Aspergillus orvzae	*Aspergillus oryzae*	k87	Alpha-amylase	14-4370-01	595
nGal d 4 Lysozyme, Egg	*Gallus domesticus*	k208	Lysozyme	14-5128-01	C0T
Foods					
rAct d 8, Kiwi, PR-10	*Actinidia deliciosa*	f430	PR-10 protein	14-4984-01	CG7
rAna o 3, Cashew nut	*Anacardium occidentale*	f443	Storage protein, 2S albumin	14-5760-01	D0W
rApi g 1.01, PR-10, Celery	*Apium graveolens*	f417	PR-10 protein	14-4957-01	CBR
rAra h 1, Peanut	*Arachis hypogaea*	f422	Storage protein, 7S globulin	14-4963-01	CDF
rAra h 2, Peanut	*Arachis hypogaea*	f423	Storage protein, 2S albumin	14-4964-01	CDG
rAra h 3, Peanut	*Arachis hypogaea*	f424	Storage protein, 11S globulin	14-4965-01	CDH
rAra h 6, Peanut	*Arachis hypogaea*	f447	Storage protein, 2S albumin	14-6041-01	DYU
rAra h 8, Peanut, PR-10	*Arachis hypogaea*	f352	PR-10 protein	14-5341-01	CEZ
rAra h 9, Peanut, LTP	*Arachis hypogaea*	f427	Lipid transfer protein (nsLTP)	14-4980-01	CFC
rBer e 1, Brazil nut	*Bertholletia excelsa*	f354	Storage protein, 2S albumin	14-5343-01	CDS
nBos d 4, Alpha-lactalbumin, Milk	*Bos domesticus*	f76	Alpha-lactalbumin	14-4522-01	CTP
nBos d 5, Beta-lactoglobulin, Milk	*Bos domesticus*	f77	Beta-lactoglobulin	14-4523-01	CTR
nBos d 8, Casein, Milk	*Bos domesticus*	f78	Casein	14-4524-01	CTS
rCor a 1, Hazelnut, PR-10	*Corylus avellana*	f428	PR-10 protein	14-4981-01	CFB
rCor a 8, Hazelnut, LTP	*Corylus avellana*	f425	Lipid transfer protein (nsLTP)	14-4968-01	CDP
nCor a 9, Hazelnut	*Corylus avellana*	f440	Storage protein, 11S globulin	14-5758-01	D0M

* Letters preceding the common name denote the raw material source: n=native, r=recombinant.

Product*		Code	Allergen family	Art. No.	Barcode
rCor a 14, Hazelnut	*Corylus avellana*	f439	Storage protein, 2S albumin	14-5754-01	CZP
rCyp c 1, Carp	*Cyprinus carpio*	f355	Parvalbumin	14-5344-01	CF0
rGad c 1, Cod	*Gadus morhua*	f426	Parvalbumin	14-4971-01	CEY
nGal d 1, Ovomucoid, Egg	*Gallus domesticus*	f233	Ovomucoid	14-4805-01	904
nGal d 2, Ovalbumin, Egg	*Gallus domesticus*	f232	Ovalbumin	14-4804-01	903
nGal d 3, Conalbumin, Egg	*Gallus domesticus*	f323	Conalbumin	14-5222-01	C18
rGly m 4, PR-10, Soy	*Glycine max*	f353	PR-10 protein	14-5340-01	CDR
nGly m 5, Beta-conglycinin, Soy	*Glycine max*	f431	Beta-conglycinin	14-4990-01	CLV
nGly m 6, Glycinin	*Glycine max*	f432	Glycinin	14-4991-01	CLU
rJug r 1, Walnut	*Juglans regia*	f441	Storage protein, 2S albumin	14-5762-01	D0T
rJug r 3, Walnut, LTP	*Juglans regia*	f442	Lipid transfer protein (nsLTP)	14-5954-01	D11
rMal d 1, PR-10, Apple	*Malus domestica*	f434	PR-10 protein	14-5703-01	CWR
rMal d 3, LTP, Apple	*Malus domestica*	f435	Lipid transfer protein (nsLTP)	14-5704-01	CWS
rPen a 1, Tropomyosin, Shrimp	*Penaeus aztecus*	f351	Tropomyosin	14-5335-01	C11
rPru p 1, Peach, PR-10	*Prunus persica*	f419	PR-10 protein	14-4960-01	CBV
rPru p 3, Peach, LTP	*Prunus persica*	f420	Lipid transfer protein (nsLTP)	14-4961-01	CBW
rPru p 4, Peach, Profilin	*Prunus persica*	f421	Profilin	14-4962-01	CBX
rPru p 7, Peach, GRP	*Prunus persica*	f454	gibberellin-regulated protein (GRP)	14-6086-01	E3Z
rSes i 1, Sesame seed, 2S Albumin	*Sesamum Indicum*	f449	Storage protein, 2S Albumin	14-6109-01	E7M
rTri a 14, LTP, Wheat	*Triticum aestivum*	f433	Lipid transfer protein (nsLTP)	14-5701-01	CN6
rTri a 19, Omega-5 Gliadin, Wheat	*Triticum aestivum*	f416	Omega-5 Gliadin	14-4954-01	C8H
Gliadin	*Triticum aestivum*	f98		14-5752-01	CXG
Miscellaneous					
nMUXF3 CCD, Bromelain		o214	CCD-marker	14-5339-01	CJU
nGal-alpha-1,3-Gal (alpha-Gal) Thyroglobulin, bovine		o215		14-5997-01	DPC

* Letters preceding the common name denote the raw material source: n=native, r=recombinant.

Allergen components on ImmunoCAP ISAC$_{E112i}$ test

Component* name	Common name	Latin name	Protein group
Grass pollen			
nCyn d 1	Bermuda grass	*Cynodon dactylon*	Grass group 1
rPhl p 1	Timothy	*Phleum pratense*	Grass group 1
rPhl p 2	Timothy	*Phleum pratense*	Grass group 2
nPhl p 4	Timothy	*Phleum pratense*	
rPhl p 5b	Timothy	*Phleum pratense*	Grass group 5
rPhl p 6	Timothy	*Phleum pratense*	
rPhl p 7	Timothy	*Phleum pratense*	Polcalcin
rPhl p 11	Timothy	*Phleum pratense*	
rPhl p 12	Timothy	*Phleum pratense*	Profilin
Weed pollen			
nAmb a 1	Ragweed	*Ambrosia artemisiifolia*	
nArt v 1	Mugwort	*Artemisia vulgaris*	
nArt v 3	Mugwort	*Artemisia vulgaris*	
nSal k 1	Saltwort	*Salsola kali*	
rChe a 1	Goosefoot	*Chenopodium album*	
rMer a 1	Annual mercury	*Mercurialis annua*	Profilin
rPar j 2	Wall pellitory	*Parietaria judaica*	Lipid transfer protein (nsLTP)
rPla l 1	Plantain (English)	*Plantago lanceolata*	
Tree pollen			
nCry j 1	Japanese ceder	*Cryptomeria japonica*	
rAln g 1	Alder	*Alnus glutinosa*	PR-10 protein

Component* name	Common name	Latin name	Protein group
rBet v 1	Birch	*Betula verrucosa*	PR-10 protein
rBet v 2	Birch	*Betula verrucosa*	Profilin
rBet v 4	Birch	*Betula verrucosa*	Polcalcin
rCor a 1.0101	Hazel pollen	*Corylus avellana*	PR-10 protein
nCup a 1	Cypress	*Cupressus arizonica*	
nOle e 7	Olive	*Olea europaea*	Lipid transfer protein (nsLTP)
rOle e 1	Olive	*Olea europaea*	
rOle e 9	Olive	*Olea europaea*	
rPla a 1	Plane tree	*Platanus acerifolia*	
rPla a 3	Plane tree	*Platanus acerifolia*	Lipid transfer protein (nsLTP)
Microorganisms			
rAlt a 1	Alternaria	*Alternaria alternata*	
rAlt a 6	Alternaria	*Alternaria alternata*	Enolase
rAsp f 1	Aspergillus	*Aspergillus fumigatus*	
rAsp f 3	Aspergillus	*Aspergillus fumigatus*	
rAsp f 6	Aspergillus	*Aspergillus fumigatus*	Mn superoxide dismutase
rCla h 8	Cladosporium	*Cladosporium herbarum*	
Animals – epidermals and proteins			
rCan f 1	Dog	*Canis familiaris*	Lipocalin
rCan f 2	Dog	*Canis familiaris*	Lipocalin
nCan f 3	Dog	*Canis familiaris*	Serum albumin
rCan f 4	Dog	*Canis familiaris*	Lipocalin

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Component* name	Common name	Latin name	Protein group
rCan f 5	Dog	*Canis familiaris*	Arginine esterase
rCan f 6	Dog	*Canis familiaris*	Lipocalin
nEqu c 3	Horse	*Equus caballus*	Serum albumin
rEqu c 1	Horse	*Equus caballus*	Lipocalin
rFel d 1	Cat	*Felis domesticus*	Uteroglobin
rFel d 2	Cat	*Felis domesticus*	Serum albumin
rFel d 4	Cat	*Felis domesticus*	Lipocalin
rMus m 1	Mouse	*Mus musculus*	Lipocalin
Mites			
nDer f 1	House dust mite	*Dermatophagoides farinae*	
rBlo t 5	House dust mite	*Blomia tropicalis*	
rDer f 2	House dust mite	*Dermatophagoides farinae*	
rDer p 1	House dust mite	*Dermatophagoides pteronyssinus*	
rDer p 2	House dust mite	*Dermatophagoides pteronyssinus*	
rDer p 10	House dust mite	*Dermatophagoides pteronyssinus*	Tropomyosin
rDer p 23	House dust mite	*Dermatophagoides pteronyssinus*	Peritrophin-like protein
rLep d 2	Storage mite	*Lepidoglyphus destructor*	
Insects			
nBla g 7	Cockroach	Blattella germanica	Tropomyosin
rBla g 1	Cockroach	*Blattella germanica*	
rBla g 2	Cockroach	*Blattella germanica*	
rBla g 5	Cockroach	*Blattella germanica*	
Parasites			
rAni s 1	Anisakis	*Anisakis simplex*	Serine protease inhibitor
rAni s 3	Anisakis	*Anisakis simplex*	Tropomyosin

Component* name	Common name	Latin name	Protein group
Occupational			
nGal-alpha-1,3-Gal	Alpha	*Thyroglobuline, bovine*	
nMUXF3	Sugar epitope from Bromelain		CCD-marker
rHev b 1	Latex	*Hevea brasiliensis*	
rHev b 3	Latex	*Hevea brasiliensis*	
rHev b 5	Latex	*Hevea brasiliensis*	
rHev b 6.01	Latex	*Hevea brasiliensis*	
rHev b 8	Latex	*Hevea brasiliensis*	Profilin
Foods			
nGal d 1	Egg white	*Gallus domesticus*	Ovomucoid
nGal d 2	Egg white	*Gallus domesticus*	Ovalbumin
nGal d 3	Egg white	*Gallus domesticus*	Conalbumin/Ovotransferrin
nGal d 5	Egg yolk/chicken meat	*Gallus domesticus*	Livetin/Serum albumin
nBos d 4	Cow's milk	*Bos domesticus*	Alpha-lactalbumin
nBos d 5	Cow's milk	*Bos domesticus*	Beta-lactoglobulin
nBos d 6	Cow's milk and meat	*Bos domesticus*	Serum albumin
nBos d 8	Cow's milk	*Bos domesticus*	Casein
nBos d lactoferrin	Cow's milk	*Bos domesticus*	Transferrin
rGad c 1	Cod	*Gadus callarias*	Parvalbumin
nPen m 1	Shrimp	*Penaeus monodon*	Tropomyosin
nPen m 2	Shrimp	*Penaeus monodon*	Arginine kinase
rPen m 4	Shrimp	*Penaeus monodon*	Sarcoplasmic Ca-binding protein

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Component* name	Common name	Latin name	Protein group
rAna o 2	Cashew nut	*Anacardium occidentale*	Storage protein, 11S globulin
rAna o 3	Cashew nut	*Anacardium occidentale*	Storage protein, 2S albumin
rBer e 1	Brazil nut	*Bertholletia excelsa*	Storage protein, 2S albumin
nCor a 9	Hazelnut	*Corylus avellana*	Storage protein, 11S globulin
rCor a 1.0401	Hazelnut	*Corylus avellana*	PR-10 protein
rCor a 8	Hazelnut	*Corylus avellana*	Lipid transfer protein (nsLTP)
rCor a 14	Hazelnut	*Corylus avellana*	Storage protein, 2S albumin
rJug r 1	Walnut	*Juglans regia*	Storage protein, 2S albumin
nJug r 3	Walnut	*Juglans regia*	Lipid transfer protein (nsLTP)
rSes i 1	Sesame seed	*Sesamum indicum*	Storage protein, 2S albumin
rAra h 1	Peanut	*Arachis hypogaea*	Storage protein, 7S globulin
rAra h 2	Peanut	*Arachis hypogaea*	Storage protein, 2S albumin
rAra h 3	Peanut	*Arachis hypogaea*	Storage protein, 11S globulin
rAra h 6	Peanut	*Arachis hypogaea*	Storage protein, 2S albumin
rAra h 8	Peanut	*Arachis hypogaea*	PR-10 protein
rAra h 9	Peanut	*Arachis hypogaea*	Lipid transfer protein (nsLTP)
nGly m 5	Soybean	*Glycine max*	Storage protein, Beta-conglycinin
nGly m 6	Soybean	*Glycine max*	Storage protein, Glycinin
rGly m 4	Soybean	*Glycine max*	PR-10 protein
nFag e 2	Buckwheat	*Fagopyrum esculentum*	Storage protein, 2S albumin
nTri a aA_TI	Wheat	*Triticum aestivum*	Alpha-amylase/Trypsin inhibitor
rTri a 14	Wheat	*Triticum aestivum*	Lipid transfer protein (nsLTP)
rTri a 19.0101	Wheat	*Triticum aestivum*	Omega-5 gliadin
nAct d 1	Kiwi	*Actinidia deliciosa*	
nAct d 2	Kiwi	*Actinidia deliciosa*	Thaumatin-like protein

Component* name	Common name	Latin name	Protein group
nAct d 5	Kiwi	*Actinidia deliciosa*	
rAct d 8	Kiwi	*Actinidia deliciosa*	PR-10 protein
rApi g 1	Celery	*Apium graveolens*	PR-10 protein
rMal d 1	Apple	*Malus domestica*	PR-10 protein
rPru p 1	Peach	*Prunus persica*	PR-10 protein
rPru p 3	Peach	*Prunus persica*	Lipid transfer protein (nsLTP)

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Notes

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