Emma is worried about having a systemic reaction, so she avoids all nuts.

Systemic reactions and underlying proteins

Discover the connection

ImmunoCAP® Complete Allergens and Allergen Components help you diagnose allergy and prepare a management plan for improved patient well-being.
Discover the connection
Between proteins and risk for systemic reactions

Dig deeper into common plant-derived food allergies

ImmunoCAP provides a two-step approach to support a comprehensive allergy diagnosis

1. COMPLETE ALLERGENS
   - Helps rule in or rule out food allergy and identify allergy triggers

2. ALLERGEN COMPONENT
   - Pinpoints the allergenic proteins causing the symptoms
Discover the connection
Between proteins and risk for systemic reactions

Dig deeper into common plant-derived food allergies

ImmunoCAP provides a two-step approach to support a comprehensive allergy diagnosis

1. **COMPLETE ALLERGENS**
   - Helps rule in or rule out food allergy and identify allergy triggers

2. **ALLERGEN COMPONENT**
   - Pinpoints the allergenic proteins causing the symptoms

- PEANUT
- HAZELNUT
- WALNUT
- APPLE
- PEACH
- BRAZIL NUT
- SOY
- CASHEW NUT
ImmunocAP Allergen Components help you assess the risk of systemic reactions in patients with allergy to peanut.

- Many patients allergic to peanuts may not be at risk for a systemic reaction.
- Allergen components are proteins associated with different levels of risk.

Allergen Components help you distinguish between cross-reactive and specific sensitizations.

"Molecular-based allergy diagnostics have emerged into routine care due to its ability to improve risk assessment, particularly for food allergies."

WAO – ARIA – GA²LEN Consensus Paper on Molecular-based Allergy Diagnostics

ImmunocAP Allergen Components help you decrease the need for provocation testing and improve recommendations for allergen avoidance.

- Cross-reactivity of peanut proteins:
  - Profilin PR-10: Stable to heat and digestion, associated with systemic reactions.
  - LTP: Labile to heat and digestion, associated with birch pollen allergy (cross-reactivity).
  - Storage Proteins: Labile to heat and digestion, associated with birch pollen allergy (cross-reactivity).

- Risk for systemic reactions:
  - Profilin:
    - Labile to heat and digestion
    - Low risk for reactions
    - Highly cross-reactive with pollen and plant foods
  - PR-10:
    - Stable to heat and digestion
    - Associated with local and systemic reactions
    - Associated with allergy to stone fruits (cross-reactivity)
  - LTP:
    - Stable to heat and digestion
    - Associated with systemic reactions
    - Indicates primary sensitization

* Surrogate marker for profilin.
Peanut: Assess risk and cross-reactivity

ImmunoCAP Allergen Components help you assess the risk of systemic reactions in patients with allergy to peanut

- Many patients allergic to peanuts may not be at risk for a systemic reaction

- Allergen components are proteins associated with different levels of risk

Allergen Components help you distinguish between cross-reactive and specific sensitizations

```
PROFILIN | PR-10 | LTP | STORAGE PROTEINS
---|---|---|---
Phi p 12* or Bet v 2* or Pru p 4* | Ara h 8 | Ara h 9 | Ara h 1, Ara h 2, Ara h 3

- Labile to heat and digestion
- Low risk for reactions
- Highly cross-reactive with pollen and plant foods

- 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 sensitization

* Surrogate marker for profilin.
```

“Molecular-based allergy diagnostics have emerged into routine care due to its ability to improve risk assessment, particularly for food allergies.”

WAO – ARIA – GA²LEN Consensus Paper on Molecular-based Allergy Diagnostics

ImmuoCAP Allergen Components help you decrease the need for provocation testing and improve recommendations for allergen avoidance
Is Emma at risk for a systemic reaction to peanuts?

Emma, 16 years old—case history:
- Has had rhinitis and conjunctivitis during every spring since school age
- Loves chocolate bars, but sometimes experiences oral itching when eating them
- Doctor suspects birch and peanut allergy
- ImmunoCAP tests are ordered to help rule in or rule out allergy

The test results confirm the doctor’s suspicions and Emma is diagnosed as birch and peanut allergic. In order to evaluate Emma’s risk for a systemic reaction, the doctor ordered ImmunoCAP Allergen Component tests.

ImmunoCAP Complete Allergen results:
- Birch: 21 kU/l
- Peanut: 18 kU/l

ImmunoCAP Allergen Component results (kU/l):

<table>
<thead>
<tr>
<th>PROFILIN</th>
<th>PR-10</th>
<th>LTP</th>
<th>STORAGE PROTEINS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pru p 4*: &lt;0.1</td>
<td>Ara h 8: 12.2</td>
<td>Ara h 9: &lt;0.1</td>
<td>Ara h 1: 0.6</td>
</tr>
<tr>
<td>Ara h 2: 4.3</td>
<td>Ara h 3: 1.2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

Increasing risk for systemic reactions

Interpretation and management:
- The Allergen Component test results show that Emma is sensitized to the storage proteins in peanut (Ara h 1, 2 and 3), indicating that she is at risk for systemic reactions
- Her sensitization to Ara h 8 is explained by cross-reactivity from her birch pollen allergy and may cause local reactions, such as oral symptoms

Doctor’s recommendations:
- Doctor advises her to strictly avoid peanut—even trace amounts—and to carry an auto-injector

Emma is at risk of systemic reactions if she eats peanuts
Is Emma at risk for a systemic reaction to peanuts?

Emma, 16 years old—case history:

- Has had rhinitis and conjunctivitis during every spring since school age
- Loves chocolate bars, but sometimes experiences oral itching when eating them
- Doctor suspects birch and peanut allergy
- ImmunoCAP tests are ordered to help rule in or rule out allergy

ImmunoCAP Complete Allergen results:

<table>
<thead>
<tr>
<th></th>
<th>Profilin (kUA/l)</th>
<th>PR-10</th>
<th>LTP</th>
<th>Storage Proteins</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pru p 4*</td>
<td>&lt;0.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ara h 8</td>
<td>12.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ara h 9</td>
<td>&lt;0.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pru p 4*</td>
<td>&lt;0.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ara h 8</td>
<td>12.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ara h 9</td>
<td>2.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ara h 3</td>
<td>1.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ara h 1</td>
<td>0.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ara h 2</td>
<td>4.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ara h 3</td>
<td>1.2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Increasing risk for systemic reactions

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

Interpretation and management:

- The Allergen Component test results show that Emma is sensitized to the storage proteins in peanut (Ara h 1, 2 and 3), indicating that she is at risk for systemic reactions
- Her sensitization to Ara h 8 is explained by cross-reactivity from her birch pollen allergy and may cause local reactions, such as oral symptoms

Doctor’s recommendations:

- Doctor advises her to strictly avoid peanut—even trace amounts—and to carry an auto-injector

Emma is at risk of systemic reactions if she eats peanuts
Sophie, 8 years old—case history:

- Diagnosed with birch pollen allergy two years ago, has shown no earlier reactions to food
- After eating yogurt with muesli for breakfast, Sophie suddenly experiences angioedema and needs transportation to the emergency department
- She recovers after administration of anti-histamines and oral steroids
- Doctor suspects hazelnut allergy and orders ImmunoCAP testing to get a more detailed understanding of the cause of her reaction

ImmunoCAP Complete Allergen results:

- Birch: 10.8 kU/l
- Hazelnut: 4.6 kU/l

The test results confirm that Sophie is allergic to birch and hazelnut.

ImmunoCAP Allergen Component results (kU/l):

<table>
<thead>
<tr>
<th>PROFILIN</th>
<th>PR-10</th>
<th>LTP</th>
<th>STORAGE PROTEINS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pru p 4*&lt;0.1</td>
<td>Cor a 1: 2.2</td>
<td>Cor a 8&lt;0.1</td>
<td>Cor a 9: 1.3 Cor a 14: 2.0</td>
</tr>
</tbody>
</table>

* Surrogate marker for profilin.

Interpretation:

- ImmunoCAP Allergen Component test results show that Sophie has a primary hazelnut allergy as she is sensitized to the storage proteins (Cor a 9 and Cor a 14), explaining her serious reaction
- Sophie’s birch pollen allergy gives rise to positive test results to Cor a 1—the birch pollen-related component in hazelnut

Doctor’s recommendations:

- Sophie should strictly avoid hazelnuts and carry emergency medication
- Sophie is at risk for systemic reaction when eating hazelnuts
Is Sophie at risk for a systemic reaction to hazelnut?

Sophie, 8 years old—case history:

- Diagnosed with birch pollen allergy two years ago, has shown no earlier reactions to food
- After eating yogurt with muesli for breakfast, Sophie suddenly experiences angioedema and needs transportation to the emergency department
- She recovers after administration of anti-histamines and oral steroids
- Doctor suspects hazelnut allergy and orders ImmunoCAP testing to get a more detailed understanding of the cause of her reaction

**ImmunoCAP Complete Allergen results:**

<table>
<thead>
<tr>
<th>Allergen</th>
<th>Concentration (kU/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birch</td>
<td>10.8</td>
</tr>
<tr>
<td>Hazelnut</td>
<td>4.6</td>
</tr>
</tbody>
</table>

The test results confirm that Sophie is allergic to birch and hazelnut.

**ImmunoCAP Allergen Component results (kU_A/l):**

- **PROFILIN**
  - Pru p 4*: <0.1
- **PR-10**
  - Cor a 1: 2.2
- **LTP**
  - Cor a 8: <0.1
- **STORAGE PROTEINS**
  - Cor a 9: 1.3
  - Cor a 14: 2.0

* Surrogate marker for profilin.

**Interpretation:**

- ImmunoCAP Allergen Component test results show that Sophie has a primary hazelnut allergy as she is sensitized to the storage proteins (Cor a 9 and Cor a 14), explaining her serious reaction
- Sophie’s birch pollen allergy gives rise to positive test results to Cor a 1—the birch pollen-related component in hazelnut

**Doctor’s recommendations:**

- Sophie should strictly avoid hazelnuts and carry emergency medication

Sophie is at risk for systemic reaction when eating hazelnuts.
Maria, 5 years old—case history:

- Diagnosed with grass pollen allergy at the age of three
- Two years later, she eats a peach and after half an hour develops urticaria and her breathing is also affected
- Her mother gave her anti-histamines and the symptoms resolved on the way to the hospital
- Doctor ordered ImmunoCAP tests to confirm the suspicion of peach allergy

ImmunoCAP Complete Allergen results:

- **Timothy**: 15.3 kU/l
- **Peach**: 17.9 kU/l

The ImmunoCAP test results show that Maria has high levels of sIgE to peach, even higher than to grass pollen.

ImmunoCAP Allergen Component results (kU/l):

- **PROFILIN**
  - Pru p 4*: 4.2
- **PR-10**
  - Pru p 1: <0.1
- **LTP**
  - Pru p 3: 15.2

Increasing risk for systemic reactions

<table>
<thead>
<tr>
<th>STORAGE PROTEINS</th>
<th>PROFILIN</th>
<th>PR-10</th>
<th>LTP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pru p 4*</td>
<td>4.2</td>
<td>&lt;0.1</td>
<td>15.2</td>
</tr>
</tbody>
</table>

* Surrogate marker for profilin.

Interpretation:

- Component test results show that Maria has a primary peach allergy as she is sensitized to Pru p 3 (LTP), which explains her systemic reaction
- She also has IgE antibodies to Pru p 4 (profilin), which most likely is due to cross-reactivity with her grass pollen sensitization

Doctor’s recommendations:

- Maria should avoid peaches, even in cooked form, and consider carrying emergency medication
- She should also be cautious with other stone fruits (e.g. apples, apricots) and nuts as cross-reactivity may cause reactions
- She should continue using anti-histamines during pollen season

Maria is at risk for systemic reaction when eating peaches
Maria, 5 years old—case history:

- Diagnosed with grass pollen allergy at the age of three
- Two years later, she eats a peach and after half an hour develops urticaria and her breathing is also affected
- Her mother gave her anti-histamines and the symptoms resolved on the way to the hospital
- Doctor ordered ImmunoCAP tests to confirm the suspicion of peach allergy

ImmunoCAP Complete Allergen results:

- Timothy: 15.3 kU/l
- Peach: 17.9 kU/l

The ImmunoCAP test results show that Maria has high levels of sIgE to peach, even higher than to grass pollen.

ImmunoCAP Allergen Component results (kU/l):

<table>
<thead>
<tr>
<th>PROFILIN</th>
<th>PR-10</th>
<th>LTP</th>
<th>STORAGE PROTEINS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pru p 4*: 4.2</td>
<td>Pru p 1: &lt;0.1</td>
<td>Pru p 3: 15.2</td>
<td></td>
</tr>
</tbody>
</table>

* Surrogate marker for profilin.

Interpretation:

- Component test results show that Maria has a primary peach allergy as she is sensitized to Pru p 3 (LTP), which explains her systemic reaction
- She also has IgE antibodies to Pru p 4 (profilin), which most likely is due to cross-reactivity with her grass pollen sensitization

Doctor’s recommendations:

- Maria should avoid peaches, even in cooked form, and consider carrying emergency medication
- She should also be cautious with other stone fruits (e.g. apples, apricots) and nuts as cross-reactivity may cause reactions
- She should continue using anti-histamines during pollen season

Maria is at risk for systemic reaction when eating peaches
Plant-derived foods: Assess risk and cross-reactivity

ImmuNoCAP Allergen Components help you assess the risk of systemic reactions in patients with allergy to plant-derived foods

- Many patients allergic to plant-derived foods may not be at risk for a systemic reaction
- Allergen components are proteins associated with different levels of risk

<table>
<thead>
<tr>
<th>ImmunoCAP COMPLETE ALLERGENS</th>
<th>PROFILIN*</th>
<th>PR-10</th>
<th>LTP</th>
<th>STORAGE PROTEINS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peanut</td>
<td>Profilin*</td>
<td>Ara h 8</td>
<td>Ara h 9</td>
<td>Ara h 1, Ara h 2, Ara h 3</td>
</tr>
<tr>
<td>Hazelnut</td>
<td>Profilin*</td>
<td>Cor a 1</td>
<td>Cor a 8</td>
<td>Cor a 9, Cor a 14</td>
</tr>
<tr>
<td>Walnut†</td>
<td>Profilin*</td>
<td>Jug r 3</td>
<td></td>
<td>Jug r 1</td>
</tr>
<tr>
<td>Brazil Nut</td>
<td>Profilin*</td>
<td></td>
<td></td>
<td>Ber e 1</td>
</tr>
<tr>
<td>Cashew Nut‡</td>
<td>Profilin*</td>
<td></td>
<td></td>
<td>Ana o 3</td>
</tr>
<tr>
<td>Soy</td>
<td>Profilin*</td>
<td>Gly m 4</td>
<td></td>
<td>Gly m 5, Gly m 6</td>
</tr>
<tr>
<td>Peach</td>
<td>Profilin*</td>
<td>Pru p 1</td>
<td>Pru p 3</td>
<td></td>
</tr>
<tr>
<td>Apple</td>
<td>Profilin*</td>
<td>Mal d 1</td>
<td>Mal d 3</td>
<td></td>
</tr>
</tbody>
</table>

**Characteristics:**
- Labile to heat and digestion
- Highly cross-reactive with pollen and plant foods

**Clinical Relevance:**
- Low risk for reaction
- Likely to tolerate foods in cooked form

*Surrogate markers for profilin: Phl p 12, Bet v 2, or Pru p 4.
†Walnut/Pecan: Patients sensitized to pecan nuts are very likely to also be IgE-reactive to walnut and vice versa. Jug r 1 and Jug r 3 may therefore be used as risk markers for both pecan and walnut allergy.
‡Cashew/Pistachio: Patients sensitized to pistachio are very likely to also be IgE-reactive to cashew nuts and vice versa. Ana o 3 may therefore be used as a risk marker for both pistachio and cashew nut allergy.
Plant-derived foods: Assess risk and cross-reactivity

ImmunoCAP Allergen Components help you assess the risk of systemic reactions in patients with allergy to plant-derived foods

- Many patients allergic to plant-derived foods may not be at risk for a systemic reaction
- Allergen components are proteins associated with different levels of risk

## Increasing risk for systemic reactions

<table>
<thead>
<tr>
<th>ImmunoCAP COMPLETE ALLERGENS</th>
<th>PROFILIN*</th>
<th>PR-10</th>
<th>LTP</th>
<th>STORAGE PROTEINS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peanut</td>
<td>Profilin*</td>
<td>Ara h 8</td>
<td>Ara h 9</td>
<td>Ara h 1, Ara h 2, Ara h 3</td>
</tr>
<tr>
<td>Hazelnut</td>
<td>Profilin*</td>
<td>Cor a 1</td>
<td>Cor a 8</td>
<td>Cor a 9, Cor a 14</td>
</tr>
<tr>
<td>Walnut†</td>
<td>Profilin*</td>
<td></td>
<td>Jug r 3</td>
<td>Jug r 1</td>
</tr>
<tr>
<td>Brazil Nut</td>
<td>Profilin*</td>
<td></td>
<td></td>
<td>Ber e 1</td>
</tr>
<tr>
<td>Cashew Nut‡</td>
<td>Profilin*</td>
<td></td>
<td></td>
<td>Ana o 3</td>
</tr>
<tr>
<td>Soy</td>
<td>Profilin*</td>
<td>Gly m 4</td>
<td></td>
<td>Gly m 5, Gly m 6</td>
</tr>
<tr>
<td>Peach</td>
<td>Profilin*</td>
<td>Pru p 1</td>
<td>Pru p 3</td>
<td></td>
</tr>
<tr>
<td>Apple</td>
<td>Profilin*</td>
<td>Mal d 1</td>
<td>Mal d 3</td>
<td></td>
</tr>
</tbody>
</table>

### Characteristics:
- Labile to heat and digestion
- Highly cross-reactive with pollen and plant foods

### Clinical Relevance:
- Low risk for reaction
- Likely to tolerate foods in cooked form

* Surrogate markers for profilin: Phl p 12, Bet v 2, or Pru p 4.
† Walnut/Pecan: Patients sensitized to pecan nuts are very likely to also be IgE-reactive to walnut and vice versa. Jug r 1 and Jug r 3 may therefore be used as risk markers for both pecan and walnut allergy.
‡ Cashew/Pistachio: Patients sensitized to pistachio are very likely to also be IgE-reactive to cashew nuts and vice versa. Ana o 3 may therefore be used as a risk marker for both pistachio and cashew nut allergy.
Is it IgE-mediated wheat food allergy?

Are the symptoms signs of immediate wheat allergy?

Is it wheat-dependent exercise-induced anaphylaxis (WDEIA)?

ImmunoCAP Allergen Components can help you find out

- ImmunoCAP Allergen Components help you assess if it really is wheat allergy and if there is a risk for systematic reactions\(^ {16,17}\)

Recommended test profile

<table>
<thead>
<tr>
<th>ImmunoCAP Complete Allergens</th>
<th>Wheat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tri a 14 (LTP)</td>
<td>Tri a 19 ((w)-5-gliadin)</td>
</tr>
<tr>
<td>• Risk for clinical reaction</td>
<td>• Risk marker for systematic reaction</td>
</tr>
<tr>
<td>• Marker for wheat allergy persistence(^ {16})</td>
<td>• Marker for wheat allergy persistence(^ {16})</td>
</tr>
</tbody>
</table>

Immediate wheat allergy

- Sensitization to wheat-specific components supports a diagnosis of IgE-mediated wheat allergy and helps rule out clinically irrelevant sensitizations due to grass pollen cross-reactivity\(^ {20,21}\)
- IgE antibodies to Tri a 19 and Gliadin are associated with severe reactions in wheat food allergies\(^ {16}\)

WDEIA

- Elicited by exercise or other co-factors, such as NSAID drugs, alcohol, or stress after wheat intake
- 30\%-50\% of patients are negative on extract based test, but the majority are sensitized to Tri a 19 and/or Gliadin\(^ {22,23}\)
Is it IgE-mediated wheat food allergy?

Are the symptoms signs of immediate wheat allergy?

Is it wheat-dependent exercise-induced anaphylaxis (WDEIA)?

ImmunoCAP Allergen Components can help you find out

- ImmunoCAP Allergen Components help you assess if it really is wheat allergy and if there is a risk for systematic reactions\(^{16,17}\)

Recommended test profile

<table>
<thead>
<tr>
<th>ImmunoCAP Allergen Components</th>
<th>Wheat</th>
</tr>
</thead>
<tbody>
<tr>
<td>ImmunoCAP Complete Allergens</td>
<td></td>
</tr>
<tr>
<td>Tri a 14 (LTP)</td>
<td>Tri a 19 (w-5-gliadin)</td>
</tr>
<tr>
<td>• Risk for clinical reaction</td>
<td>• Risk marker for systematic reaction</td>
</tr>
<tr>
<td>• Risk marker for systematic reaction</td>
<td>• Marker for wheat allergy persistence(^{19})</td>
</tr>
</tbody>
</table>

Immediate wheat allergy

- Sensitization to wheat-specific components supports a diagnosis of IgE-mediated wheat allergy and helps rule out clinically irrelevant sensitizations due to grass pollen cross-reactivity\(^{20,21}\)
- IgE antibodies to Tri a 19 and Gliadin are associated with severe reactions in wheat food allergies\(^{16}\)

WDEIA

- Elicited by exercise or other co-factors, such as NSAID drugs, alcohol, or stress after wheat intake
- 30%-50% of patients are negative on extract based test, but the majority are sensitized to Tri a 19 and/or Gliadin\(^{22,23}\)
You've discovered the connection
Now see the benefits of ImmunoCAP allergy blood testing

ImmunoCAP Allergen Components help pinpoint proteins causing the symptoms

• Can help access risk for systemic reactions and explain symptoms due to cross-reactivity
• Assess tolerance to baked foods
• Can help you decrease the need for provocation testing and improve recommendations for allergen avoidance