Diagnosis in Allergy in children: Skin Prick Test

Zsolt Szépfalusi
Department of Pediatrics
Medical University of Vienna
Food allergy - diagnosis

- No single laboratory test diagnostic for FA
- Controlled elimination / challenge tests mandatory
  - disappearance of symptoms on elimination diet
  - recurrence of identical symptoms after controlled challenge
  - symptoms on a diet containing suspected foods
  - exclusion of lactose intolerance and coincidental infection
- DBPCFC after the age of 2 years

A correct diagnosis is necessary to ensure a sufficient and safe diet
Skin Prick Test

Allergen

Disease

Sensitization phase

Effector phase

Mediator Release

Asthma
Rhinitis
Food allergy
Atopic dermatitis
## Skin Prick Test

### Specific IgE

<table>
<thead>
<tr>
<th>Study population (years)</th>
<th>Age total of</th>
<th>Number of challenges</th>
<th>Allergen</th>
<th>Specific IgE cut-off level (kU/l)</th>
<th>Predicted probability for positive reaction (%)</th>
<th>Reference</th>
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<tr>
<td>US</td>
<td>≤ 14</td>
<td>Total of 196</td>
<td>Cow's milk</td>
<td>32</td>
<td>95</td>
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<td>95</td>
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<td></td>
<td>Peanut 68</td>
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<td>95</td>
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<tr>
<td>German</td>
<td>≤ 16</td>
<td>398</td>
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<td>*</td>
<td>99</td>
<td>(23)</td>
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<td></td>
<td></td>
<td>Hen's egg 227</td>
<td>13</td>
<td>95</td>
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<td>Cow's milk 398</td>
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<td>*</td>
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<td>French</td>
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<td>363</td>
<td>Peanut</td>
<td>57</td>
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<tr>
<td>Korean</td>
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<td>Buckwheat</td>
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<td>(25)</td>
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</tbody>
</table>

*Calculations did not yield 95% predictive values.
†Efficiency.
‡Positive predictive value.

### Skin Prick Test

<table>
<thead>
<tr>
<th>Study population (years)</th>
<th>Age total of</th>
<th>Number of challenges</th>
<th>Allergen</th>
<th>Skin prick test cut-off wheal diameter (mm)</th>
<th>Predicted probability for positive reaction (%)</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australian</td>
<td>≤ 16</td>
<td>339</td>
<td>Cow's milk</td>
<td>8</td>
<td>100†</td>
<td>(30, 45)</td>
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<td>7</td>
<td>100†</td>
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<td></td>
<td>Peanut 95</td>
<td>8</td>
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<tr>
<td>Australian</td>
<td>≤ 2</td>
<td>27</td>
<td>Cow's milk</td>
<td>6</td>
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<tr>
<td></td>
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<td>Peanut 33</td>
<td>4</td>
<td>100†</td>
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<tr>
<td>Spanish</td>
<td>≤ 2</td>
<td>81</td>
<td>Hen's egg</td>
<td>3</td>
<td>91†</td>
<td>(11)</td>
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<tr>
<td>French</td>
<td>≤ 16</td>
<td>363</td>
<td>Peanut</td>
<td>16</td>
<td>100†</td>
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<td>Hen's egg 118</td>
<td>17.8</td>
<td>99</td>
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</tr>
</tbody>
</table>

*Specificity.
†Efficiency.
‡Positive predictive value.
Skin Prick Test

- Sensitivity: 76-98%
- Specificity: 29-57%
- Positive predictive value: <20%
- Negative predictive value: 95 – 99%
Diagnostische Möglichkeiten

**In vivo:**

**Pricktest**

- Sensitivität: 76-98%
- Spezifität: 29-57%
- Positiver prädiktiver Wert: <20%
- Negativer prädiktiver Wert: 95 – 99%
Skin Prick Test
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Skin Prick Test
Skin Prick Test

- Histamine
- Feather
- Cat
- Dog
- Horse
- Sheep Wool
- Plane Pollen
- Birch Pollen
- Grass Pollen
- Daisy Pollen
- Alternaria (mould)
- Negative Control
Skin Prick Test
Skin Prick Test

1. All the SPTs should be performed by the **SAME investigator** during the study
2. SPT can be performed at any age
3. SPT can be performed in and out of allergy season
4. Tested food should be from natural sources to which child demonstrates allergic symptoms and/or a positive IgE is present
5. SPT should be performed with frozen skin test material made from powder
   a. cow’s milk
   b. hen’s egg
   c. soy
   d. wheat = gluten powder (1g/10ml)
   e. peanut
6. Do not refreeze material after thawing
7. Use prick-to-prick test for tree nuts, seeds and fish
8. Use AZK for allergens which will be included in the DBPCFC
9. **Positive** *(histamine)* and **negative** *(saline)* control tests must also be performed
10. Ask whether antihistamines have taken before commencing test. No antihistamines 72 hours before skin prick testing!
Skin Prick Test

Procedure

a) Test may be done on underarm or back
b) Clean and degrease the skin
c) Place a small drop on the volar surface of the forearm
d) Avoid applying allergen extract drops over a vein
e) 1 mm tip, sterile disposable ALK lancets
f) One lancet per allergen
g) Place allergens at least 2-3 cm apart
h) Insert the lancet perpendicular to the skin passing through the drop
i) Make a 1 mm deep prick
j) Make the prick short (1 sec) with constant pressure for each prick
k) Use a new lancet for each drop, being careful not to contaminate the other
l) 1 minute after each prick, dab (don’t wipe)
m) Use tricks to distract the child by blowing or gently rubbing the surroundings
n) Read after 15 min.
Skin Prick Test
Skin Prick Test

**Reading results**

a. Outline the contours of each wheal with a fine filter tip pen
b. Only the wheal counts, not the reddened area
c. The contours are then transferred to the record sheet by means of translucent tape
d. The size of each wheal is documented as the mean of the longest diameter and the diameter perpendicular to it at its mid-point
e. In dark skin wheals can be recognized more easily under strong oblique light and also by palpating the skin
f. Measurements of each diameter are made to the nearest millimetre above
g. Note the results in mm for D (e.g. a1) and d (e.g. a2) on SPT documentation
Skin Prick Test

Allergen

\[ \frac{a_1 + a_2}{2} = A \]

Histamine

\[ \frac{h_1 + h_2}{2} = H \]

Skin Index (SI) = \[ \frac{A}{H} \]
Skin Prick Test

Allergen

\[
\frac{7 + 5}{2} = 6
\]

Histamine

\[
\frac{4 + 3}{2} = 3.5
\]

Skin Index (SI) = \( \frac{6}{3.5} = 1.8 \)
Skin Prick Test

Evaluation

a. Negative control must be negative
b. Positive control must be positive
c. Allergen wheal $\geq 3$ mm is positive
d. Skin Index $\geq 0.6$ is positive
e. Wheal $< 3$ mm is always negative
f. Wheal $\geq 3$ mm and skin index $< 0.6$ is possibly positive
g. Wheal $\geq 3$ mm and skin index $\geq 0.6$ is positive
h. Wheal $\geq 3$ mm and skin index $\geq 1.0$ is definitely positive

Literature

- Dreborg S. Skin tests used in type I allergy testing. Position paper. Allergy 1989, suppl. 10.
## Skin Prick Test

<table>
<thead>
<tr>
<th>Extract</th>
<th>Fix adhesive tape here</th>
<th>D</th>
<th>d</th>
<th>D+d/2</th>
<th>Ratio to histamine</th>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>2. Histamine</td>
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<td></td>
<td>X</td>
</tr>
<tr>
<td>3. Milk</td>
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<td></td>
</tr>
<tr>
<td>4. Hen(\text{&amp;}) egg</td>
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<td>5. Soy</td>
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<td>6. Wheat</td>
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</tr>
<tr>
<td>7. Peanut</td>
<td></td>
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<tr>
<td>8. Codfish</td>
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