Food Allergy and Atopic Eczema

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Relationship between Food Allergy & Atopic Dermatitis

- Food allergy → Atopic dermatitis
- Atopic dermatitis → Food allergy
- Atopic dermatitis ↔ Food allergy
Prevalence of AD in FA

<table>
<thead>
<tr>
<th></th>
<th>Peanut Allergic</th>
<th>Egg Allergic</th>
<th>Unselected</th>
</tr>
</thead>
<tbody>
<tr>
<td>% with eczema</td>
<td>91.3</td>
<td>88.1</td>
<td>42</td>
</tr>
</tbody>
</table>

*p<0.001*
**Prevalence of food allergy* and atopic dermatitis**

<table>
<thead>
<tr>
<th>Study</th>
<th>Year</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sampson</td>
<td>1985</td>
<td>56%</td>
</tr>
<tr>
<td>Sampson</td>
<td>1995</td>
<td>73%</td>
</tr>
<tr>
<td>Eigenmann (Baltimore)</td>
<td>1998</td>
<td>37%</td>
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<tr>
<td>Eigenmann (Geneva)</td>
<td>2000</td>
<td>27%</td>
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<tr>
<td>Niggemann</td>
<td>1999</td>
<td>81%</td>
</tr>
<tr>
<td>Roehr</td>
<td>2001</td>
<td>55%</td>
</tr>
</tbody>
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* Proven by DBPCFC
The relationship between eczema severity and the frequency of high-risk IgE food sensitization (HR-IgE-FS) to foods according to the age of onset of eczema is shown. The children with the most severe eczema (Q4), and the earliest age of onset (3 months), had the greatest frequency of HR-IgE-FS.

Does food allergy cause atopic dermatitis?

- Oral Provocation Studies
- Interventional Studies
Oral Provocation Studies

- 139 children, mean age 13 months
- Mild AD 59%, Moderate 32%, Severe 9%
- Suspected food involvement by doctor or parent

Niggemann B. J Allergy Clin Immunol 2001; 108: 1053-1058
DBPCFC to milk, egg, wheat and soy in children median age 2 years with AD and suspected FA

106 challenges in 64 patients

57 Positive challenges

43.5% Immediate reactions only

45% Delayed eczematous lesions after immediate symptoms

56.5% Delayed eczematous Lesions*

56.5% Delayed eczematous lesions after immediate symptoms

12% Delayed eczematous lesions only

49 Negative challenges

43.5% Immediate reactions only

45% Delayed eczematous lesions after immediate symptoms

12% Delayed eczematous lesions only

Delayed = >24hrs

*Mean increase in SCORAD 14.2, p<0.001

Causes of late eczematous reactions

- Milk: 28%
- Egg: 27%
- Soya: 9%
- Wheat: 21%
- Other: 15%

Does food allergy cause atopic dermatitis?

- **Oral Provocation Studies**

- **Interventional Studies**
Interventional studies: Can Dietary Restriction Improve Atopic Dermatitis?

- 16 interventional studies to address this
- No meta-analyses
- Varying
  - Study populations
  - Intervention
  - Design
  - Outcome measures

Review of Studies

- 15 of 16 studies report some response, but variable
- Interventions most effective in infants
- Successful interventions include egg, milk & wheat avoidance
- Effect is generally small

Relationship between Food Allergy & Atopic Dermatitis

- Food allergy \rightarrow \text{Atopic dermatitis}

- \text{Atopic dermatitis} \rightarrow \text{Food allergy}

- \text{Atopic dermatitis} \leftrightarrow \text{Food allergy}
Cutaneous Route

Saloga et al. Am J Respir Crit Care Med 1994; 149: 65-70
Route of peanut exposure

Cutaneous exposure

PEANUT ALLERGY (PA)

CLA + T cells

α4β7+ T cells

Oral exposure

PEANUT TOLERANT (NA)

CLA+ and α4β7+ proliferation as a percentage of total CLA+ and α4β7+ proliferation to 400µg/ml peanut in each patient on day 5, showing proliferation to peanut predominating in the CLA subset of PA patients and a more mixed response in peanut tolerant (NA) patients.

Peanut allergy is associated with:

- Eczema: OR = 2.6, 95%CI 1.4 - 5.0
- Oozing crusted rash: OR = 5.2, 95%CI 2.7 - 10.2
- Topical Arachis oil: OR = 6.8 , 95%CI 1.4-32.9

Lack G et al. NEJM 2003; 348: 977-985
Proportion of allergic children with peanut allergy as a function of household peanut consumption during infancy, and as a function of maternal peanut consumption during pregnancy

Household peanut consumption and infant environmental peanut exposure

Spearman's rho = 0.769, p < 0.001
Filaggrin

• Filaggrin forms a dense protein lipid matrix regulating permeability of the skin to water and external particles

• Loss-of-function filaggrin mutations:
  – Common (up to 10%) in Caucasian populations
  – Associated with up to 50% of moderate-severe eczema
  – Associated with peanut allergic (OR 5.3; CI 2.8-10.2) in UK and Canada even after controlling for coexistent eczema (p=0.0008)

Brown SJ et al. JACI 2011; 127(3-4): 661–667
Normal Patient

Filaggrin Deficient Patient

Adapted from Irvine AD et al. N Engl J Med 2011;365:1315-27
Summary

- Food allergy ➔ Atopic dermatitis
- Atopic dermatitis ➔ Food allergy
- Atopic dermatitis ➔ Food allergy