Immunotherapy for Food Allergy: Is it Ready for Primetime?

Bruce J. Lanser, MD
Assistant Professor of Pediatrics
Director, National Jewish Health Pediatric Food Allergy Center
Associate Director, Pediatric Allergy Fellowship Training Program
Disclosures

- Advisory Board: Almmune
- Research Support: Almmune, DBV
- Member: NIH/NIAID sponsored Consortium on Food Allergy Research (CoFAR)
Objectives

- Review the methods of immunotherapy currently under investigation (OIT, EPIT and SLIT)
- Understand the efficacy and safety of these methods
- Understand the immunologic effects of these therapies
FOOD ALLERGY BACKGROUND

FOOD ALLERGY AWARENESS WEEK
Celebrating 20 Years of Action, Education & Support
GI Hypersensitivities

IgE-Mediated

- Immediate Hypersensitivity (aka Food Allergy)
- Oral Allergy Syndrome

Mixed

- Eosinophilic Esophagitis (EoE)
- Eosinophilic GI Disease (EGID)

Non-IgE-Mediated

- Food Protein-Induced Enterocolitis (FPIES)
- Milk Protein Intolerance
- Lactose Intolerance
- Celiac Disease
- “Food Sensitivities”
Background

- Roughly 8% of children have a food allergy
  - ~3% of all children have multiple food allergies
- Food allergies are increasing worldwide
- Some allergies are persisting longer in children today
- Children with eczema are at significantly higher risk for food allergy
- IgE-mediated food allergy is triggered by a specific protein in the food

- Standard of care is unsatisfying
- Strict avoidance
- Education
  - Reading labels
  - Recognizing and treating a reaction
  - Natural history
  - Managing special situations
- How to use autoinjectable epinephrine
- Providing Food Allergy Action Plans
- Nutritional monitoring

Epidemic Increase in Food Allergy

Food Allergy Prevalence (Reported, NHIS data)

Jackson KD, et al. NCHS data brief, no 121. 2013
EARLY INTRODUCTION OF HIGHLY ALLERGENIC FOODS
NIAID Addendum Guidelines – 2017

- If not high risk, introduce PN at 4-6m, as developmentally appropriate
- High risk infants (severe eczema, and/or egg allergy)

Guidelines

Addendum guidelines for the prevention of peanut allergy in the United States: Report of the National Institute of Allergy and Infectious Diseases–sponsored expert panel

<table>
<thead>
<tr>
<th>TABLE S-I. Typical peanut-containing foods, their peanut protein content, and feeding tips for infants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount containing approximately 2 g of peanut protein</td>
</tr>
<tr>
<td>17 g or 7/8 of a 28-g (1-oz) bag or 21 sticks</td>
</tr>
<tr>
<td>Typical serving size</td>
</tr>
<tr>
<td>Peanut protein per typical serving</td>
</tr>
<tr>
<td>Feeding tips</td>
</tr>
</tbody>
</table>

Notes: Bamba (Osem, Israel) is named because it was the product used in the LEAP trial and therefore has known peanut protein content and proven efficacy and safety. Other peanut puff products with similar peanut protein content can be substituted for Bamba.

Teaspoons and tablespoons are US measures (5 and 15 mL for a level teaspoon or tablespoon, respectively).

Important Terms

- **Hyposensitization** - Historical term for immunotherapy

- **Desensitization**
  - Reversible state of increased threshold induced by short-term exposure to an allergen
  - Once administration of the allergen is discontinued, the previous level of clinical reactivity returns

- **Sustained Unresponsiveness (SU)**
  - Lack of clinical reaction to food allergen after active therapy has been discontinued for a period of time
  - Typically demonstrated during an OFC performed several weeks after stopping active treatment

- **Tolerance**
  - Long-lasting “cure” of an allergy
  - Persistent unresponsiveness to an antigen without regular consumption

- **Spontaneous Resolution**
  - Observed in about 20% of PN allergic patients, consistent with natural history studies
IT History and Challenges

- Reports of IT for food allergy date back to the early 1900s
- The first randomized controlled trial for IT was published in 2005

- Early studies were open label
- Many studies are small
- Methods and maintenance doses vary significantly
- Duration of therapy tends to be short
  - Most under 1y
- Few have examined SU
- The end-points have been highly variable

Wood RA. JACI 2016;137:973-82.
Food Allergy IT – Immune Responses

- IgG4 may be a marker of tolerance, but does not currently have clinical utility outside of food allergy immunotherapy studies

What’s the Goal?

• Protection from accidental exposures
• Reducing risk
• Decreased anxiety
• NOT a cure
• MAYBE eating *ad lib*
• Current methods likely will require a long duration of therapy

“Decide whether or not the goal is worth the risks involved. If it is, stop worrying.”

------------------ Amelia Earhart ------------------
PEANUT OIT
General OIT Dosing Scheme

Dose Build-up:
Daily dosing with observed dose increases q1-2 weeks over 3-9 months

Screening and Baseline Challenge

Initial dose escalation day (max 10-25 mg)

Repeat Challenges (5-10 grams)
Many studies also include a final challenge off therapy to distinguish transient desensitization from sustained unresponsiveness

Home Maintenance x months – years (doses 500 mg to 4000 mg)

6-12 Months
18+ Months

Wood RA. JACI 2016;137:973-82.
Peanut Dosing Amounts

1 peanut pod typically containing 2 peanut kernels

1 peanut kernel ~ 250-300 mg

1/2 peanut kernel ~ 125-150 mg

How much is a single 2 tablespoon serving of nut butter? About the size of a ping pong ball.
## Summary of Peanut OIT Studies

<table>
<thead>
<tr>
<th>Reference</th>
<th>Year</th>
<th>Design</th>
<th>Sample size</th>
<th>Subject age (y)</th>
<th>Maintenance dose (mg)</th>
<th>Duration</th>
<th>Primary outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jones et al</td>
<td>2009</td>
<td>Open label</td>
<td>29</td>
<td>1-16</td>
<td>1800</td>
<td>36 mo</td>
<td>93% Passed 3.9-g peanut OFC</td>
</tr>
<tr>
<td>Blumchen et al</td>
<td>2010</td>
<td>Randomized open label</td>
<td>23</td>
<td>3-14</td>
<td>500</td>
<td>7-d Rush escalation, 8-wk maintenance period</td>
<td>64% Reached maintenance of 500 mg of peanut</td>
</tr>
<tr>
<td>Varshney et al</td>
<td>2011</td>
<td>Randomized, placebo controlled</td>
<td>19</td>
<td>3-11</td>
<td>2000</td>
<td>48 wk</td>
<td>84% Passed 5000-mg peanut OFC</td>
</tr>
<tr>
<td>Anagnostou et al</td>
<td>2011</td>
<td>Open label</td>
<td>22</td>
<td>4-18</td>
<td>800</td>
<td>32 wk</td>
<td>64% Tolerated 6.6-g OFC</td>
</tr>
<tr>
<td>Anagnostou et al</td>
<td>2014</td>
<td>Randomized, controlled</td>
<td>39</td>
<td>7-16</td>
<td>800</td>
<td>26 wk</td>
<td>62% Tolerated 1400-mg challenge</td>
</tr>
<tr>
<td>Vickery et al</td>
<td>2014</td>
<td>Open label</td>
<td>24</td>
<td>1-16</td>
<td>Up to 4000</td>
<td>Up to 5 y</td>
<td>50% SU to 5000-mg OFC after 4-wk avoidance</td>
</tr>
<tr>
<td>Narisety et al</td>
<td>2014</td>
<td>Randomized, placebo controlled</td>
<td>16</td>
<td>7-13</td>
<td>2000</td>
<td>12 mo</td>
<td>OIT &gt; SLIT in OFC threshold, low rate of SU</td>
</tr>
<tr>
<td>Vickery et al</td>
<td>2016</td>
<td>Two dose</td>
<td>40</td>
<td>&lt;4</td>
<td>30; 300</td>
<td>&gt;18 mo</td>
<td>High rate of desensitization</td>
</tr>
</tbody>
</table>

Efficacy and Safety of AR101 in Oral Immunotherapy for Peanut Allergy: Results of ARC001, a Randomized, Double-Blind, Placebo-Controlled Phase 2 Clinical Trial

- DBPC, Phase II, RCT
- 55 subjects, 4-21y
- Study product is AR101
  - Highly characterized, medical grade
  - Containing Ara h 1, 2, 3, 6 and 8
  - 300mg maintenance dose
- No serious AEs
  - GI AEs were the most common
    - 66% of active and 27% of placebo
    - 21% of active subjects withdrew
      - All with peanut sIgE >100
      - 1 subject developed EoE

Infant OIT

- Randomized, DBPC, dose ranging trial of peanut OIT in infants 9-36 months old
  - History of prior reaction, or peanut sIgE >5
  - 40 subjects
- 85% desensitized, 78% achieved 4 week SU (went on to eat *ad lib*)
- Acceptable safety profile
  - 14% withdrew, 3/5 due to AEs
  - 1 case of EoE
  - 1 use of epi at home, but no serious AEs
- Lower dose (300mg) sufficient
- Baseline sIgE associated with SU

Probiotic + Peanut OIT

• Initial results
  • 45% of P+POIT subjects experienced AEs
  • 2-wk SU: 23/28 (82%) P+POIT vs 1/28 placebo

• 4 year follow-up
  • 67% were still consuming peanut
  • 12 subjects stopped consuming for 8 weeks
    • 58% demonstrated SU

• Limitations
  • No entry DBPCFC (open OFC in only 40% of subjects)
  • SU OFCs at 2 to 5.3 weeks after d/c of P+POIT
  • NO control groups with peanut OIT alone or Probiotic alone

## Is OIT effective?

<table>
<thead>
<tr>
<th>Study or subgroup</th>
<th>Control Events</th>
<th>Control Total</th>
<th>Experimental Events</th>
<th>Experimental Total</th>
<th>Weight (%)</th>
<th>RR</th>
<th>95% CI</th>
<th>M-H, Random, 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burks 2012</td>
<td>0</td>
<td>15</td>
<td>22</td>
<td>40</td>
<td>4.1</td>
<td>0.06</td>
<td>0.00, 0.88</td>
<td></td>
</tr>
<tr>
<td>Caminiti 2009</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>4.2</td>
<td>0.20</td>
<td>0.01, 2.98</td>
<td></td>
</tr>
<tr>
<td>Lacono 2013</td>
<td>0</td>
<td>10</td>
<td>9</td>
<td>10</td>
<td>4.2</td>
<td>0.05</td>
<td>0.00, 0.80</td>
<td></td>
</tr>
<tr>
<td>Longo 2008</td>
<td>0</td>
<td>30</td>
<td>11</td>
<td>30</td>
<td>4.1</td>
<td>0.04</td>
<td>0.00, 0.71</td>
<td></td>
</tr>
<tr>
<td>Mansouri 2007</td>
<td>0</td>
<td>13</td>
<td>18</td>
<td>20</td>
<td>4.2</td>
<td>0.04</td>
<td>0.00, 0.62</td>
<td></td>
</tr>
<tr>
<td>Martorell 2011</td>
<td>7</td>
<td>30</td>
<td>27</td>
<td>30</td>
<td>11.1</td>
<td>0.26</td>
<td>0.13, 0.50</td>
<td></td>
</tr>
<tr>
<td>Meglio 2013</td>
<td>2</td>
<td>10</td>
<td>8</td>
<td>10</td>
<td>8.6</td>
<td>0.25</td>
<td>0.07, 0.90</td>
<td></td>
</tr>
<tr>
<td>Morisset 2007</td>
<td>18</td>
<td>32</td>
<td>24</td>
<td>28</td>
<td>12.0</td>
<td>0.66</td>
<td>0.47, 0.92</td>
<td></td>
</tr>
<tr>
<td>Morisset 2007</td>
<td>18</td>
<td>39</td>
<td>34</td>
<td>51</td>
<td>11.9</td>
<td>0.69</td>
<td>0.47, 1.02</td>
<td></td>
</tr>
<tr>
<td>Pajno 2010</td>
<td>0</td>
<td>15</td>
<td>10</td>
<td>15</td>
<td>4.1</td>
<td>0.05</td>
<td>0.00, 0.75</td>
<td></td>
</tr>
<tr>
<td>Patriarca 1998</td>
<td>0</td>
<td>10</td>
<td>12</td>
<td>14</td>
<td>4.2</td>
<td>0.05</td>
<td>0.00, 0.83</td>
<td></td>
</tr>
<tr>
<td>Patriarca 2003</td>
<td>0</td>
<td>16</td>
<td>45</td>
<td>59</td>
<td>4.2</td>
<td>0.04</td>
<td>0.00, 0.60</td>
<td></td>
</tr>
<tr>
<td>Patriarca 2007</td>
<td>0</td>
<td>10</td>
<td>31</td>
<td>36</td>
<td>4.2</td>
<td>0.05</td>
<td>0.00, 0.80</td>
<td></td>
</tr>
<tr>
<td>Skripak 2008</td>
<td>0</td>
<td>7</td>
<td>12</td>
<td>13</td>
<td>4.2</td>
<td>0.07</td>
<td>0.00, 1.03</td>
<td></td>
</tr>
<tr>
<td>Staden 2007</td>
<td>7</td>
<td>21</td>
<td>9</td>
<td>26</td>
<td>10.6</td>
<td>0.96</td>
<td>0.43, 2.15</td>
<td></td>
</tr>
<tr>
<td>Varshney 2011</td>
<td>0</td>
<td>9</td>
<td>16</td>
<td>19</td>
<td>4.2</td>
<td>0.06</td>
<td>0.00, 0.91</td>
<td></td>
</tr>
</tbody>
</table>

Total (95% CI) 270 404 100.0 0.19 0.09, 0.37

Total events 52 290

Heterogeneity: $\chi^2 = 0.99; \chi^2 = 72.51, df = 15 (P < 0.00001); I^2 = 79$

Test for overall effect: $Z = 4.80 (P < 0.00001)$

Eosinophilic Esophagitis (EoE)

- EoE typically resolves after discontinuing therapy
- Has not been systematically evaluated
- No study has assessed for EoE prior to starting therapy
- Systematic review of subjects undergoing peanut, milk and egg OIT (2014)
  - 2.7% (95%CI 1.7-4%) developed new-onset EoE
- Milk OIT in 57 children (2017)
  - 5.2% (n=3) developed EoE
- EoE has not been observed in patients undergoing EPIT
  - Cases of EoE during environmental SLIT, but not food
- Patients should be counseled regarding the risk of EoE before initiating OIT
- Providers must monitor for symptoms of EoE

Rachid R & Keet C. JACI IP 2018, in press.
Quality of Life

- Food Allergy Quality of Life Questionnaire (FAQLQ) before and after egg OIT in 22 children and their parents (2015)
  - Minimal improvement in health-related quality of life per parents
  - Children reported:
    - A benefit in dietary restriction
    - A negative impact by allergic reactions due to OIT

- STOP II Trial – Open Peanut OIT
  - 62% of 39 children (7-16y) achieved desensitization
  - Both active and placebo groups showed a clinically significant improvement in QOL scores

- Current Phase III peanut OIT and EPIT studies have used the FAQLQ

PEANUT EPIT

IN AN IRONIC TWIST OF FATE, DEATH SUCCUMBS TO HIS PEANUT ALLERGY
EPIT

- Sample dosing regiment
  - 3h/d x1w
  - 6h/d x1w
  - 12h/d x1w
  - Maintain at 24h/d
Basic Mechanism

EPIT Trials Summary

- Initial studies done using milk, with a different maintenance regiment
- Few human studies published in peer reviewed journals
- After dose-finding studies, current studies using 250mcg (VP250) patch

- VIPES and OLFUS-VIPES, peanut (Sampson 2017)
  - Phase IIb and open label follow-up, DBPC OFC
  - 1 year, then 2 additional years
  - 221 → 171 subjects (83%), ages 6 to 49y

- CoFAR 6, peanut (Jones 2017)
  - Phase II, DBPC OFC
  - 1 year
  - 74 subjects, ages 4 to 25y

## EPIT Summary

### Efficacy

- **VIPES**
  - Responders – ED >1g or >10x increase in ED from entry OFC to 12m
    - 41-50% overall (25% placebo)
    - 46-57% of ages 6-11y (20% placebo)

- **OLFUS-VIPES**
  - Response rates increased with time
    - Up to 68% in younger children

- **CoFAR 6**
  - Responders – 5g or 10x increase in SCD
    - 48% overall (12% placebo)
    - 61% of children 4-11y

### Safety

- **VIPES**
  - 6.4% dropout rate (3 due to AEs)
  - TAAEs in ~95% on therapy (2x placebo)
    - Majority are local skin reactions
    - Wane with duration of therapy
    - Generalized TAAEs in ~25% (skin reactions beyond the patch)
  - No serious TAAEs attributed to therapy
    - 3 due to accidental peanut exposure

- **OLFUS-VIPES**
  - 31.6% dropped out (2 due to AEs)

- **CoFAR 6**
  - 6 dropouts (3 active), 1 for severe skin reactions
  - No epi given
PEANUT SLIT
Peanut SLIT Dosing Regiment

Maintenance (→24 months)

Day 1

1 drop/day → 0.25 mcg
5 drops/day → 1.25 mcg
1 drop/day → 2.5 mcg
8 drops/day → 20 mcg
4 drops/day → 10 mcg
2 drops/day → 5 mcg
1 drop/day → 2.5 mcg
4 drops/day → 10 mcg
2 drops/day → 5 mcg
1 drop/day → 250 mcg
8 drops/day → 200 mcg
4 drops/day → 100 mcg
2 drops/day → 50 mcg
1 drop/day → 25 mcg
1/10 Dilution
1/100 Dilution
1/1000 Dilution

Build up (26 weeks, 4 dilutions)

2000 mcg ≈ 1/100th peanut

1 peanut = 300 mg

Sublingual immunotherapy for peanut allergy: Long-term follow-up of a randomized multicenter trial

A. Wesley Burks, MD, Robert A. Wood, MD, Stacie M. Jones, MD, Scott H. Sicherer, MD, David M. Fleischer, MD, Amy M. Scurlock, MD, Brian P. Vickery, MD, Andrew H. Liu, MD, Alice K. Henning, MS, Robert Lindblad, MD, Peter Dawson, PhD, Marshall Plaut, MD, and Hugh A. Sampson, MD, for the Consortium of Food Allergy Research (CoFAR)

Chapel Hill, NC, Baltimore, Rockville, and Bethesda, Md, Little Rock, Ark, New York, NY, and Denver, Colo

- 3-year f/u after daily dosing
- Placebo subjects given higher dose of SLIT (~3.7 mg daily) and treatment group maintained on lower dose (~1.4 mg daily), without significant different in outcome
- 98% of doses were tolerated without adverse reactions beyond the oropharynx, with no severe reactions and no epi
- >50% of participants discontinued therapy
- Only 4/37 participants were fully desensitized

A randomized, double-blind, placebo-controlled pilot study of sublingual versus oral immunotherapy for the treatment of peanut allergy

Satya D. Narisety, MD, a Pamela A. Frischmeyer-Guerrero, MD, PhD, b* Corinne A. Keet, MD, MS, b Mark Gorelik, MD, b John Schroeder, PhD, c Robert G. Hamilton, PhD, c and Robert A. Wood, MD b

Conclusions
- OIT is more clinically effective than SLIT
- AEs and dropouts are higher with OIT
- Pre-treatment with SLIT led to fewer AEs
  - though did not prevent intolerable GI symptoms

OTHER FOODS
Follow-up surveys for 32 milk allergic OIT participants administered 1 to 5 years after study discontinuation

<table>
<thead>
<tr>
<th>Symptoms with milk consumption</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Totals</td>
<td>32</td>
</tr>
<tr>
<td>No symptoms</td>
<td>8 (25%)</td>
</tr>
<tr>
<td>Frequent/predictable symptoms</td>
<td>12 (38%)</td>
</tr>
<tr>
<td>Frequent/predictable, more than oral/pharyngeal</td>
<td>9 (28%)</td>
</tr>
<tr>
<td>Sporadic symptoms</td>
<td>7 (22%)</td>
</tr>
<tr>
<td>Sporadic, more than oral/pharyngeal</td>
<td>5 (16%)</td>
</tr>
<tr>
<td>Not consuming milk</td>
<td>5 (16%)</td>
</tr>
<tr>
<td>Anaphylaxis at least once</td>
<td>6 (19%)</td>
</tr>
<tr>
<td>Used epinephrine at least once</td>
<td>3 (9%)</td>
</tr>
</tbody>
</table>

Poor long-term outcome associated with
- CM IgE > 75 kU/L
- Post-treatment food challenge threshold of <4 g
- Or combination of respiratory sx with >2% of doses during escalation and maintenance and any of the above
• 48 subjects (13 placebo), 5-11y
• No entry OFC (convincing clinical history and elevated markers)
• Maintenance = 2g egg protein daily
• OFCs performed after 10 and 22 months
  • 10 months
    • 55% desensitized v. 0 placebo
  • 22 months
    • 75% desensitized v. 28% of placebo subjects developing tolerance
• 28% demonstrated SU (after 6-8w off therapy)
Baked Milk and Egg – “Immunotherapy-Lite”

• “The search for biomarkers that reliably predict the tolerability of baked milk and egg is ongoing”
  • Trend towards tolerant subjects having lower sIgE’s to cow’s milk, casein, egg white, and ovomucoid and smaller SPTs to egg white and cow’s milk

• If tolerating baked milk and/or egg, but allergic to milk or egg as such…
  • Continue including baked goods in the diet

• If allergic to milk or egg as such, but has never eaten baked milk or egg
  • Strongly consider referral to an allergist for evaluation and possible oral food challenge to baked egg/milk
  • Allergists should challenge most patients with egg or milk allergy
  • Provide patient education regarding recipes and frequency of eating

Robinson ML & Lanser BJ Immunol Allergy Clinic N AM 2018;38: 65-76.
Omalizumab as an Adjunct to OIT

- Omalizumab is a humanized, monoclonal anti-IgE antibody
  - FDA approved for severe asthma and chronic idiopathic urticaria
- Being investigated off-label as an adjunct to immunotherapy, including food
  - By reducing the concentration of free/circulating IgE, it can prevent mast cell activation

- Overall
  - Subjects receiving omalizumab reach maintenance dosing faster and with fewer reactions
  - Initial doses are larger, meaning fewer up-dosing visits
  - Doses may need to be adjusted after stopping omalizumab

HAVE WE ACHIEVED THE GOAL?

“Decide whether or not the goal is worth the risks involved. If it is, stop worrying.”

__________________________ Amelia Earhart ___________________________
Conclusions

- OIT is effective for several foods
  - Can achieve desensitization in a majority of patients
  - May result in SU or ad-lib dietary inclusion in some patients
      - May be more likely with longer duration of therapy, starting at a younger age, and having a lower baseline sIgE
      - More study is needed regarding SU
  - Side effects continue to be significant and limit therapy in ~25%
      - Omalizumab can help reduce reactions
      - EoE remains a concern

- EPIT
  - Less effective than OIT, but better safety profile
  - Can achieve an increase in threshold to peanut (maybe milk)
  - SU has NOT been studied
  - Local AD in nearly all patients, but very rarely limits therapy

- SLIT
  - Perhaps least efficacious, but perhaps the best tolerance
## Conclusions

<table>
<thead>
<tr>
<th></th>
<th>OIT</th>
<th>SLIT</th>
<th>EPIT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Maintenance Dose</strong></td>
<td>300 mg – 4000 mg</td>
<td>~1 mg – ~4 mg</td>
<td>250 mcg</td>
</tr>
<tr>
<td><strong>Activity Restriction</strong></td>
<td>Take dose with meal • No activity for ~2 hours after ingestion • Withhold with illness</td>
<td>Do not eat for ~30 mins after dosing</td>
<td>Do not apply to inflamed skin (e.g., active eczema)</td>
</tr>
<tr>
<td><strong>Observed Dosing Required?</strong></td>
<td>Up-dosing is observed, in clinic • ~10 visits</td>
<td>Some doses observed (change in concentration • ~4 visits</td>
<td>Initiation and periodic f/u only • Few visits, as clinically indicated</td>
</tr>
<tr>
<td><strong>Optimal Treatment Age</strong></td>
<td>Likely to have a long-lasting benefit in young • Has shown efficacy across ages</td>
<td>Better in children • Long-term data lacking</td>
<td>Most effective in 4 to 11y • NOT effective in adolescents and adults</td>
</tr>
<tr>
<td><strong>Side-Effects</strong></td>
<td>Common mild A/Ees • Frequent GI sx’s • Anaphylaxis possible</td>
<td>Uncommon • Mostly mild OP • Anaphylaxis possible</td>
<td>Localized AD at patch site • Anaphylaxis not reported</td>
</tr>
</tbody>
</table>
Remaining Questions & Challenges

• Await final phase 3 trial results for peanut OIT and EPIT
  • Perform rigorous studies in younger patients
• OIT has shown greatest clinical efficacy of studied products
  • Has the most AEs associated (mostly mild)
  • Requires the greatest commitment from patient and physician
• Develop surrogate biomarkers to determine efficacy outside of OFCs
• Develop biomarkers to identify those patients likely to be treatment failures
• How best to choose which therapy for which patient?
  • Could SLIT or EPIT be good "pre-treatments" for OIT?
• Will patients continue taking therapy indefinitely?
• Is there a better way to promote sustained unresponsiveness?
  • SU must be studied more rigorously for all modalities
• Can patients safely and successfully transition to *ad lib* ingestion?
• Are patients and families better off after treatment than before?
  • Does therapy actually reduce accidental exposures?
THANK YOU!

A special thank you to my mentors, Drew Bird, Allan Bock, and Donald Leung
Questions & Discussion

National Jewish Health
for kids
Immunotherapy for Food Allergy: Is it Ready for Primetime?

Bruce J. Lanser, MD
Assistant Professor of Pediatrics
Director, National Jewish Health Pediatric Food Allergy Center
Associate Director, Pediatric Allergy Fellowship Training Program