Clinical Recommendations for Reducing and Preventing Food Allergies

Presented by
Hugh A. Sampson, MD
Kurt Hirschhorn Professor of Pediatrics
Department of Pediatrics
Icahn School of Medicine at Mount Sinai

Marion Groetch, MS, RDN
Director of Nutrition Services
Jaffe Food Allergy Institute
Division of Allergy & Immunology
Icahn School of Medicine at Mount Sinai

ANNENBERG CENTER FOR HEALTH SCIENCES
AT EISENHOWER
Imparting knowledge. Improving patient care.
Faculty Presenters

Hugh A. Sampson, MD
Kurt Hirschhorn Professor of Pediatrics
Department of Pediatrics
Icahn School of Medicine at Mount Sinai
New York, New York

Marion Groetch, MS, RDN
Director of Nutrition Services
Jaffe Food Allergy Institute
Division of Allergy and Immunology
Icahn School of Medicine at Mount Sinai
New York, New York
## Faculty Disclosures

### Hugh A. Sampson, MD

<table>
<thead>
<tr>
<th>Role</th>
<th>Institution/Company</th>
<th>Clinical Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research Support</td>
<td>National Institutes of Health</td>
<td></td>
</tr>
<tr>
<td>Consultant</td>
<td>N-Fold Therapeutics</td>
<td></td>
</tr>
<tr>
<td>Shareholder</td>
<td>DBV Technologies, N-Fold Therapeutics</td>
<td>food allergy</td>
</tr>
</tbody>
</table>

**clinical area for above: food allergy**

### Marion Groetch, MS, RDN

<table>
<thead>
<tr>
<th>Role</th>
<th>Institution/Company</th>
<th>Clinical Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speakers Bureau</td>
<td>Abbott, Nutricia, Mead Johnson Nutrition</td>
<td></td>
</tr>
</tbody>
</table>

**clinical area for above: food allergy**
Learning Objectives

1. Develop management strategies to optimize nutrition in the allergic child and prevent allergic progression.

2. Interpret the latest evidence for introducing allergenic food in the first years.
INTRODUCTION

• Food allergy prevalence
• The link between food allergies and poor growth
Most Common Allergens

Eight food groups account for 90% of all food allergies in the United States.

- milk
- egg
- fish
- shellfish
- wheat
- soy
- peanut
- tree nuts

Food Allergies Limit Growth

- Food allergies can negatively affect growth and food intake\(^1-3\)

- Growth limitations are likely attributable to elimination diets and inadequate nutrient intake\(^1\)

- Below-average weight and height persists into childhood for those with food allergies, particularly for milk allergies\(^4\)

### Height-for-Age by Allergy Status\(^1\)

<table>
<thead>
<tr>
<th>Participants</th>
<th>&lt;25th</th>
<th>25th – 75th</th>
<th>&gt;75th</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthy controls (n = 96)</td>
<td>17%</td>
<td>56%</td>
<td>27%</td>
</tr>
<tr>
<td>Children with food allergy (n = 95)</td>
<td>28%</td>
<td>52%</td>
<td>20%</td>
</tr>
<tr>
<td>Allergic to 1 food (n = 32)</td>
<td>16%</td>
<td>50%</td>
<td>34%</td>
</tr>
<tr>
<td>Allergic to ≥2 foods (n = 63)</td>
<td>35%</td>
<td>52%</td>
<td>13%</td>
</tr>
</tbody>
</table>

Milk Avoidance Compared With Other Food Avoidance†

In a retrospective medical records review of children from a single center, with avoidance on the basis of real or perceived food allergies. WFL/BMI, weight for length for participants less than 2 years of age and body mass index for participants 2 years or older.

International Survey on Growth in Children With Food Allergy†

- Cow's milk elimination led to lower weight-for-height Z scores than elimination of other foods
- Mixed IgE and non-IgE-mediated allergy had lower height-for-age Z scores than IgE-mediated allergy.
- Overall, the data indicated:
  - 9% were stunted
  - 6% were underweight
  - 5% were undernourished
  - 8% were overweight

Children particularly at risk of poor growth are those with non-IgE- and mixed IgE/non-IgE-mediated allergies, as well as those with cow's milk allergy.

†In a study of 430 children from 12 centers.
OPTIMIZING NUTRITION FOR THE ALLERGIC CHILD
Avoid Unnecessary Elimination Diets

Elimination Diets in Children With AD†

Elimination diets can place children at risk for poor growth and nutritional deficiency.1,2

1Necessary elimination diet was one in which cow's milk allergy was confirmed with a double-blind placebo-controlled food challenge. Unnecessary elimination diet was one in which a double-blind placebo-controlled trial confirmed tolerance of cow's milk and cow's milk was successfully reintroduced. AD, atopic dermatitis.

Diagnosing Food Allergy: When Elimination Diets Are Necessary

• Long-term elimination diets should only be recommended by specialists for documented food allergy

• Skin prick testing results may be positive in cases where the food can be tolerated

For more information, see *Diagnosing Food Allergies in Infants and Children* with Jonathan Spergel, MD, PhD.
<table>
<thead>
<tr>
<th>Food</th>
<th>Choose healthy infant foods*</th>
<th>How much/how often as part of the infant's complementary diet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peanut^</td>
<td>Choose peanut flour or thinned peanut butter that has no added ingredients (salt, sugar, oils) for healthier options! Peanut butter should be thinned with breastmilk, water or formula or mixed into a pureed food, eg, 2 teaspoons of peanut butter mixed with 2-3 teaspoons liquid.</td>
<td>About 1-2 teaspoons peanut butter/powder per serving, served 2-3 times per week as tolerated.</td>
</tr>
<tr>
<td>Egg</td>
<td>Serve well-cooked egg mashed with pureed foods or chopped and served as finger food.</td>
<td>About 1/3 of a well-cooked egg, 2-3 times per week</td>
</tr>
<tr>
<td>Wheat</td>
<td>Infant wheat cereals (iron-fortified for the breastfed infant); whole wheat toast, pasta or crackers for older infants.</td>
<td>½-1 oz total grains per day.</td>
</tr>
<tr>
<td>Milk</td>
<td>Plain, full-fat yogurt can be mixed into pureed fruit or vegetable; cow's milk should not substitute for breast milk or infant formula.</td>
<td>2-4 fl oz per day</td>
</tr>
<tr>
<td>Sesame^</td>
<td>Tahini is sesame paste typically served as an ingredient in hummus or as tahini dipping sauce for finger foods like vegetables.</td>
<td>&gt; or = 3 teaspoons seeds/any nuts per week</td>
</tr>
<tr>
<td>Seafood</td>
<td>Low mercury finfish <a href="https://www.fda.gov/media/102331/download">https://www.fda.gov/media/102331/download</a></td>
<td>1 oz per serving, 3 times per week. (See FDA link for frequency and type of fish)</td>
</tr>
<tr>
<td>Tree nuts^</td>
<td>Smooth, thinned nut butters, eg, almond, cashew, hazelnut, pistachio, walnut</td>
<td>&gt; or = 3 teaspoons seeds/any nut per week</td>
</tr>
<tr>
<td>Soy</td>
<td>Soft tofu</td>
<td>2 tablespoons per serving</td>
</tr>
</tbody>
</table>

**BENEFICIAL for prevention**
- When developmentally ready** around 6 months of age or between 4-6 months of age if advised by your doctor due to high risk of allergy (severe eczema or egg allergy)***
- BENEFICIAL for prevention but effective dose requires further research when developmentally ready after 4-6 months of age**

**HAVE NOT BEEN STUDIED SUFFICIENTLY**
- to know if early introduction decreases risk of allergy, therefore doses are based on healthy feeding#
- There is currently no evidence of benefit to delay introduction of highly allergenic foods after 4-6 months of age and developmentally ready**

When beginning complementary feeding, offer single ingredient foods one at a time initially to determine tolerance. There is no prescribed number of days or feedings required to determine tolerance but we recommend only one new food per meal.

**How do I know if my infant is developmentally ready? Here are some signs:
- Holds head upright
- Closes mouth around a spoon can open mouth and lean forward to accept a spoon
- Can sit with some assistance.

Offer your baby 1-2 foods prior to offering potentially allergenic foods to ensure they are developmentally ready to eat complementary foods.

***For most infants with severe eczema and/or egg allergy who are already eating solid foods, introducing foods containing ground peanuts between 4 and 10 months of age and continuing consumption may reduce the risk of developing peanut allergy by 3 years of age. The FDA has determined, however, that the evidence supporting this claim is limited to one study. If your infant has severe eczema and/or egg allergy, check with your infant's healthcare provider before feeding foods containing ground peanuts.

# Infant feeding
- Protein foods, modified for texture, such as peanut, tree nuts, egg, sesame, fish, and soy can be fed as healthy additions in the infant diet within this recommended framework.
- We recommend introducing potential allergenic foods early and feeding them regularly rather than a prescribed amount as long as it is within the context of healthy infant feeding.
- See Online Supplement S1 for further infant feeding guidance.

^ Peanut and Tree nuts and Sesame
- Peanut, tree nuts and sesame are protein foods with higher fat and calorie content therefore, a smaller serving size is more appropriate.
- Balance these higher fat/protein foods with lower fat foods such as fish, soy, and other proteins not considered highly allergenic such as lean meats, poultry, legumes, etc.
- Doses for tree nut prevention are not known.
- It may not fit within healthy infant feeding regimens to aim for 1-2 teaspoons of each tree nut per week.
- See mixed nut butter recipe in online Supplement S2.

Goal doses of food protein per week from EAT study: 2 g of each allergenic food protein twice each week (4 g of allergen protein per food per week). The full weekly amount for the allergenic foods consisted of 2 small 40- to 60-g portions of cow's milky yogurt, 3 rounded teaspoons of peanut butter, 1 small hard-boiled egg (≤53 g), 3 rounded teaspoons of sesame paste, 25 g of whitefish, and 2 wheat-based cereal biscuits (e.g. Weetabix).
A Patient-Specific Approach to Develop an Exclusion Diet to Manage Food Allergy in Infants and Children

**Foods to avoid and degree of avoidance**

**Industry and environment**
- Travelling and immigration
- Food and nutrition literacy
- Threshold levels and cross-contact or cross-contamination

**Suitable substitutes**

**Nutrition**
- Promote optimal growth
- Prevent nutrient deficiencies
- Development of normal feeding skills
- Optimal nutrition for long-term health

**Self-management skills**

**Future**
The role of nutrients, dietary patterns, and other food factors regarding:
- Gut microbiome
- Immune system
- Allergy prevention and tolerance development

**Co-existing and cross-reacting allergens**

**Novel allergens**

<table>
<thead>
<tr>
<th>Allergen</th>
<th>Lost nutrients</th>
<th>Suggested alternatives (if not allergic)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk</td>
<td>Protein, fat, calcium, riboflavin, phosphorous, vitamins A, D, B12</td>
<td>Meat, fish, poultry, legumes, eggs, fortified milk substitutes, calcium-fortified foods or drinks</td>
</tr>
<tr>
<td>Eggs</td>
<td>Protein, iron, biotin, folacin, riboflavin, vitamins A, D, E, B12, selenium</td>
<td>Meats, fish, poultry, legumes, dairy, leafy greens, enriched grains</td>
</tr>
<tr>
<td>Soy</td>
<td>Protein, thiamin, riboflavin, iron, calcium, zinc, vitamin B6</td>
<td>Meats, fish, poultry, legumes, eggs, dairy, fruit, vegetables, leafy greens, enriched grains</td>
</tr>
<tr>
<td>Wheat</td>
<td>Thiamin, niacin, riboflavin, folate, iron, fiber</td>
<td>Meats (iron), whole and fortified alternate grain products (oats, buckwheat, amaranth, millet, quinoa, teff, sorghum), seeds, legumes</td>
</tr>
<tr>
<td>Peanuts and tree nuts</td>
<td>Protein, vitamins, minerals</td>
<td>Meats, fish, poultry, eggs, dairy, fruit, vegetables, enriched grains, seeds</td>
</tr>
<tr>
<td>Fish and shellfish</td>
<td>Protein, PUFA (fatty fish) iodine, B12, A, E</td>
<td>Meats, poultry, eggs, fruit, vegetables, enriched grains, seeds, marine algae and seaweed</td>
</tr>
</tbody>
</table>
## Nutrients in Cow’s Milk and Substitutes

<table>
<thead>
<tr>
<th>Cow’s milk or enriched substitute</th>
<th>kCal per 8 oz</th>
<th>Protein (g)</th>
<th>Fat (g)</th>
<th>Calcium (mg)/Vitamin D (IU)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cow’s Milk</td>
<td>150</td>
<td>8</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Pea</td>
<td>100</td>
<td>8</td>
<td>4.5</td>
<td></td>
</tr>
<tr>
<td>Soy</td>
<td>100</td>
<td>7</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Oat</td>
<td>120</td>
<td>4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Rice</td>
<td>120</td>
<td>1</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>Coconut</td>
<td>80</td>
<td>0</td>
<td>4.5</td>
<td></td>
</tr>
<tr>
<td>Almond</td>
<td>50</td>
<td>1</td>
<td>2.5</td>
<td></td>
</tr>
</tbody>
</table>

Varies based on fortification!

⚠️ Milk substitutes are not nutritionally equivalent.
Encourage Breastfeeding and Ensure Adequate Maternal Nutrition

• Fatty acid composition of breast milk reflects maternal diet.

• Secretion into milk is **rapidly and substantially** reduced by maternal depletion of the following nutrients:
  - Thiamin
  - Riboflavin
  - Vitamin B-6
  - Vitamin B-12
  - Choline
  - Retinol
  - Vitamin A
  - Vitamin D
  - Selenium
  - Iodine

• Maternal supplementation with these nutrients can increase breast milk concentrations and **improve infant health**.
Hypoallergenic Formulas

- **Extensively hydrolyzed formulas** (eHF)
- **Amino acid–based formulas** (peptide-free)
- **Not Hypoallergenic**
  - Partially hydrolyzed formulas are not hypoallergenic.¹
  - European formulas labeled “HA” are typically partially hydrolyzed.²
  - Soy formula is also not hypoallergenic but may be tolerated by those with cow’s milk allergy—especially those with IgE-mediated allergy—and may be used after 6 months of age.¹

---
The Importance of Feeding in Infancy

- Complementary feeding should be aligned with physiological, oral and motor skills beginning around 6 months of age (and not sooner than 4 months)
- Infants will generally accept a new flavor on the first presentation\(^1\)
- In contrast children 2–5 years need multiple exposures to a new food\(^1\)
- Early introduction of a variety of flavors and textures can impact long-term food acceptance
- Children introduced to lumpy solids after 9 months ate less of many food groups at 7 years of age including fruits and vegetables \((P < .05)\) and were significantly more likely to have feeding problems at 7 years \((P < .05)\) \(^2\)

There is no reason to delay introduction of complementary foods beyond 6 months, including those complementary foods thought to be highly allergenic.\(^3\)

---

Ensure That the Diet Is Balanced!

Typical needs of a 1 year old

USDA MyPlate
www.choosemyplate.gov

Dietary and Nutritional Counseling Improves Nutritional Status†

<table>
<thead>
<tr>
<th>Median nutrient intake</th>
<th>Healthy children at baseline (n = 66)</th>
<th>Patients with food allergy</th>
<th>6 months after counseling (n = 85)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Energy intake (kcal/kg/d)</strong></td>
<td>96</td>
<td>91*</td>
<td>97.3†</td>
</tr>
<tr>
<td><strong>Macronutrients</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carbohydrate (g/kg/d)</td>
<td>4.9</td>
<td>5.1</td>
<td>6.0*‡</td>
</tr>
<tr>
<td>Fat (g/kg/d)</td>
<td>4.2</td>
<td>3.8</td>
<td>3.6*</td>
</tr>
<tr>
<td>Protein (g/kg/d)</td>
<td>4.6</td>
<td>2.2*</td>
<td>3.6*‡</td>
</tr>
<tr>
<td><strong>Micronutrients</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fiber (g/d)</td>
<td>7.2</td>
<td>5.8</td>
<td>11.2*‡</td>
</tr>
<tr>
<td>Calcium (mg/d)</td>
<td>848.3</td>
<td>314.4*</td>
<td>600*‡</td>
</tr>
<tr>
<td>Iron (mg/d)</td>
<td>7.0</td>
<td>6.1</td>
<td>8.0*‡</td>
</tr>
<tr>
<td>Zinc (mg/d)</td>
<td>4.1</td>
<td>3.0*</td>
<td>4.5†</td>
</tr>
</tbody>
</table>

*P < .01 vs healthy children at baseline. †P < .01 vs patients with allergy at baseline.

†In a prospective, interventional study of children aged 6–36 months with food allergies.
Vitamin and Mineral Supplementation

- May be appropriate if adequate vitamin and mineral intake cannot be obtained with food substitutes

- Common supplementation needs:
  - **Cow’s milk allergy**: calcium and vitamin D
  - **Multiple allergies**: individualized approach to supplementing

<table>
<thead>
<tr>
<th>Age</th>
<th>Calcium (mg/day)</th>
<th>Vitamin D (IU/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 6 months</td>
<td>210</td>
<td>400</td>
</tr>
<tr>
<td>7 to 12 months</td>
<td>270</td>
<td>400</td>
</tr>
<tr>
<td>1 to 3 years</td>
<td>500</td>
<td>600</td>
</tr>
<tr>
<td>4 to 8 years</td>
<td>800</td>
<td>600</td>
</tr>
<tr>
<td>9 to 18 years</td>
<td>1300</td>
<td>600</td>
</tr>
</tbody>
</table>

Recommended Dietary Intake

Dietary reference intake calculator for health care professionals: https://fnic.nal.usda.gov/fnic/dri-calculator/

# Dietary Effects of Elimination Diet

<table>
<thead>
<tr>
<th></th>
<th>Without eliminations</th>
<th>Eliminations</th>
<th>With substitutions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Breakfast</strong></td>
<td>Waffles with syrup</td>
<td>Waffles</td>
<td>Gluten-free, milk-free, egg-free waffles made with</td>
</tr>
<tr>
<td></td>
<td>Strawberries</td>
<td>Strawberries</td>
<td>buckwheat</td>
</tr>
<tr>
<td></td>
<td>Milk</td>
<td>Milk</td>
<td>Strawberries</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Elemental formula (8 oz)</td>
</tr>
<tr>
<td><strong>Lunch</strong></td>
<td>Turkey on whole wheat</td>
<td>Turkey on whole wheat</td>
<td>Turkey on teff tortilla with lettuce and canola oil-</td>
</tr>
<tr>
<td></td>
<td>with cheese, lettuce</td>
<td>with cheese, lettuce</td>
<td>based mayonnaise or cranberry sauce</td>
</tr>
<tr>
<td></td>
<td>and mayonnaise</td>
<td>and mayonnaise</td>
<td>Carrots with hummus</td>
</tr>
<tr>
<td></td>
<td>Carrots with ranch dressing</td>
<td>Carrots with ranch dressing</td>
<td>Alternative yogurt smoothie with frozen peaches</td>
</tr>
<tr>
<td></td>
<td>Pudding</td>
<td>Pudding</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Juice</td>
<td>Juice</td>
<td></td>
</tr>
<tr>
<td><strong>Snack</strong></td>
<td>Corn chips with guacamole</td>
<td>Corn chips with guacamole</td>
<td>Corn chips with guacamole</td>
</tr>
<tr>
<td><strong>Dinner</strong></td>
<td>Hamburger Helper</td>
<td>Hamburger Helper</td>
<td>Lean ground beef with marinara on chick pea noodles</td>
</tr>
<tr>
<td></td>
<td>(ground beef,</td>
<td>(ground beef,</td>
<td>Spinach salad with lettuce, tomato, peppers, cheese,</td>
</tr>
<tr>
<td></td>
<td>macaroni, cheese,</td>
<td>macaroni, cheese,</td>
<td>ranch dressing</td>
</tr>
<tr>
<td></td>
<td>tomato sauce)</td>
<td>tomato sauce)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Spinach salad with</td>
<td>Spinach salad with</td>
<td>Elemental formula (8 oz)</td>
</tr>
<tr>
<td></td>
<td>lettuce, tomato,</td>
<td>lettuce, tomato,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>peppers, cheese,</td>
<td>peppers, cheese,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ranch dressing</td>
<td>ranch dressing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Milk</td>
<td>Milk</td>
<td></td>
</tr>
<tr>
<td><strong>Snack</strong></td>
<td>Ice cream</td>
<td>Ice cream</td>
<td>Coconut ice cream</td>
</tr>
</tbody>
</table>

Key Takeaways

1. Encourage breastfeeding exclusively to 4–6 months of age and continuing breastfeeding while introducing complementary foods.

2. Consider breast milk, optimal hypoallergenic formula, or beverage choice and appropriate volumes and/or vitamin/mineral supplementation as needed.

3. Encourage a healthy diet rich in fruits, vegetables, fibers in particular digestible fibers, and long chain PUFA.

4. Do not delay introduction of complementary foods.

5. Provide an otherwise individualized approach to meet nutritional needs within the context of the allergen elimination diet.
Online Patient Resources

www.cofargroup.org

www.foodallergy.org
REDUCING THE RISK OF ALLERGY

• Milestone LEAP, EAT, and PETIT studies
• Solid food introduction and allergies
• Skin barrier maintenance and allergies
180-Degree Change in Prevention Rationale

American Academy of Pediatrics Guidelines on Preventing Food Allergy

**2000**
- **Wait to introduce allergenic foods:**
  - Milk: 1 year
  - Eggs: 2 years
  - Nuts and fish: 3 years

**2008**
- **No evidence for delaying introduction of allergenic foods:**
  - Milk, eggs, nuts, and fish: 4-6 months

**2019**
- **No evidence for delaying introduction of allergenic foods:**
  - Milk, eggs, tree nuts, and fish: 4-6 months
- **Early introduction of peanuts may be beneficial for infants at high risk for allergy:**
  - Peanuts: 4-6 months

---
180-Degree Change in Prevention Rationale

American Academy of Pediatrics Guidelines on Preventing Food Allergy

**2000**
- Wait to introduce allergenic foods:
  - Milk: 1 year
  - Eggs: 2 years
  - Nuts and fish: 3 years

**2008**
- No evidence for delaying introduction of allergenic foods:
  - Milk, eggs, nuts, and fish: 4-6 months

**2015**
- No evidence for delaying introduction of allergenic foods:

**2019**
- Early introduction of peanuts may be beneficial for infants at high risk for allergy:
  - Nuts and fish: 4-6 months

LEAP Study Design

Infants aged 4–11 months with severe eczema, egg allergy, or both

n = 640

Peanut SPT

1-4 mm

n = 98

No wheal

n = 542

Random assignment

Avoidance

n = 270

Consumption

n = 272

Random assignment

Avoidance

n = 51

Consumption

n = 47

Clinic visits at baseline, 12, 30, 60, and 72 months

SPT, skin prick test.

Primary and Secondary Prevention of Allergies at 60 Months†

In the intention-to-treat analysis, as determined by an oral food challenge (96.4%) or diagnostic algorithm (1.7%).

LEAP-ON Follow-up Study

LEAP Study

Avoidance  
n = 270

Consumption  
n = 272

Avoidance  
n = 51

Consumption  
n = 47

Clinic visits at baseline, 12, 30, 60, and 72 months

LEAP-ON Follow-up Study

All participants in ITT population were eligible  
n = 556 of 628 eligible participants

12 months

Oral peanut challenge at 72 months of age

Avoidance of dietary consumption of peanuts

Persistence of Peanut Tolerance After Avoidance at 72 Months†


†In the enrolled participants in the follow-up study who had a peanut-allergy outcome that could be evaluated.
2017 NIAID Addendum Guideline Recommendations

Peanut sIgE

- <0.35 kUₐ/L
  - Risk of reaction low
  - Refer to specialist for consultation and evaluation

- ≥0.35 kUₐ/L
  - Introduce peanut at home
    OR
  - Supervised feeding in the office

Severe eczema AND/OR Egg allergy

- Peanut SPT
  - 0-2 mm
    - Risk of reaction low
  - 3-8 mm
    - Risk of reaction varies from moderate to high
  - >8 mm
    - Probably allergic

Peanut avoidance recommended; refer to specialist for consultation and evaluation

Infants aged 3 months and exclusively breast-fed
n = 1303

Random assignment

Early introduction
Introduction of 2 g cow’s milk, peanut, cooked egg, sesame, whitefish, and wheat twice-weekly

Standard introduction
Exclusive breast-feeding to 6 months of age, with allergic food introduction by parental discretion at 6 months

Clinic visits at 1 and 3 years of age

SPT, skin prick test.

Prevalence of Allergy Between 1 and 3 Years

- No significant difference in food allergy between groups by intention-to-treat analysis
- Adherence was lower for early feeding group (42.8%) than for standard feeding group (92.9%)

Early Introduction of Egg and Egg Allergy: Systematic Review and Meta-analysis

- Of 416 articles identified and screened, 6 randomized controlled trials met eligibility criteria for data extraction.

- Allergic outcomes evaluated in a total of 3032 participants.

- A low to moderate level of evidence showed a benefit of early introduction of egg.

- Consumption of less than 4 g/week of egg protein had greater preventive effect than a higher dose.

PETIT Study Design

Infants aged 4–5 months with eczema and no history of egg ingestion
n = 147

Random assignment

50 mg heated egg powder per day

250 mg heated egg powder per day

Open oral food challenge

n = 73

6 Months

n = 74

Placebo

9 Months

Placebo

12 Months

All participants: Aggressive treatment of eczema and maintenance of control without exacerbations

Throughout intervention period

Prevalence of Egg Allergy at 12 Months†

In the primary analysis population. Sensitization cut-off was 0.35 kU/L of egg-white specific IgE at baseline.

Early Introduction of Cow’s Milk: Observational Study

- A total of 5276 12-month-old infants were recruited from the HealthNuts longitudinal population-based food allergy study.
- SPT to cow’s milk allergy was performed on 2715 participants.
  - Sensitization: wheal ≥2 mm.
- Early exposure to cow’s milk protein was determined by parental questionnaire at 1 year of age.

Dietary Measures With No Proven Benefit or Insufficient Evidence

• Supplementation with vitamins A, D, E, and C; zinc; or selenium


• Supplementation with probiotics


• Introduction of hypoallergenic formulas


• Exclusive breastfeeding


• Maternal PUFA supplementation during pregnancy or lactation


PUFA, long chain polyunsaturated fatty acids.
Rising Prevalence of Food and Skin Allergies

Eczema Is Associated With Development of Food Allergy

- Eczema increases the odds of developing food allergy, multiple food allergy, and specific types of food allergy
- Earlier onset eczema increases odds of food allergy
- More severe eczema increases odds of food allergy

Skin Barrier Disruption Can Influence the Development of Allergies

1. Disrupted barrier (FLG mutation or dryness from cleansing/environment)
2. Allergen and irritant influx
3. Inflammatory T-cell responses initiated by keratinocytes (e.g., TSLP) and dendritic cells

Atopic dermatitis initiation

Atopic dermatitis prevention

Mixed results on whether emollient therapy improves skin barrier enough to prevent allergy development

Food Allergy and Skin Barrier Disruption

Supporting evidence for allergic sensitization through skin:

- Allergic reactions to foods can occur without prior oral exposure
- Oral exposures in infancy generally lead to tolerance
- Atopic dermatitis and food allergy are highly comorbid
- Peanut allergy correlates with household peanut consumption and not individual peanut intake

Proposed Model

1. Skin barrier disruption
2. Environmental exposure to allergen and epicutaneous absorption
3. Systemic sensitization
4. Development of food allergy
Enhancement of Skin Barrier to Prevent Atopic Dermatitis

- Protection of the skin barrier from dryness and irritation along with aggressive treatment of inflammation may prevent sensitization
- Decrease use of bathing, soaps, and anti-microbials
- Apply emollients
- Limit allergen contact exposure
- Treat inflammation aggressively
Application of Emollient to Prevent Atopic Dermatitis

- Randomized controlled trial of daily emollient application beginning by 3 weeks of age in infants at risk of atopic dermatitis† in the United Kingdom and United States
- Infants were randomly assigned to daily emollient treatment (n = 64) and no emollient treatment (n = 60)
- At 6 months, the risk of atopic dermatitis was decreased by 50% with emollient treatment relative to no treatment (20% vs 43%; $P = .017$)
- Did not evaluate sensitization to allergens

†At risk for atopic dermatitis defined as biologic parent or sibling with disease.

Application of Moisturizer to Prevent Atopic Dermatitis

- Enrolled neonates with one biologic parent or sibling with atopic dermatitis
- Participants were randomly assigned to receive emulsion-type moisturizer daily during the first 32 weeks of life (n = 59) or to control (n = 59)
  - All participants were prescribed petrolatum at the request of the institutional review board
- Intervention was associated with significantly lower risk of developing AD ($P = .012$)
- No significant difference in sensitization to egg
  - 38% vs 45% for treated vs control
  - 56% of infants who developed AD had IgE to egg (>0.7 kU/L)

Recently Released Negative Results Regarding Skin Interventions and Atopic Dermatitis

- **PreventADALL** study of 2172 infants revealed no benefit to skin or food interventions initiated at birth (and possibly risks)
  - Rates of atopic dermatitis at 12 months ($P = .003$):
    - 11.1% in **skin intervention** group (oil baths and Ceridal cream applied to the face)
    - 9.0% in **food intervention** group (introduction of peanut, milk, wheat, and egg between 3 and 6 months)
    - 5.3% in **food and skin intervention** group
    - 8.1% in **no intervention** group

- **BEEP** study of 693 high-risk babies revealed no benefit to skin intervention initiated at birth
  - Rates of eczema at 2 years ($P = .61$):
    - 23% in **skin intervention** group (application of double-based gel or cream emollient for 12 months)
    - 25% in **no intervention** group

Anticipated Randomized Controlled Trial: PEBBLES

- A total of 760 infants with a family history of allergic disease will be recruited from maternity hospitals in Melbourne

- **Intervention:** Application of a ceramide-dominant emollient 2 times per day from birth to 6 months

- **Primary outcomes:** Presence of AD and food allergy in the first 12 months of life

- Phase 3 trial is underway, with results expected in 2021

Key Takeaways: Measures to Prevent Development of Food Allergy Through Environmental Exposure

- Reduce/eliminate environmental exposure to foods
- Have to address environmental exposure and skin barrier in high-risk children
- Parental education programs (bathing and eczema care)
- Daily use of petrolatum for barrier protection
- Treat eczema or atopic dermatitis aggressively
Key Takeaways

• There is no evidence for delaying the introduction of common allergenic foods beyond 4 to 6 months
  • For infants at high risk for peanut allergy, may be beneficial to introduce peanuts at 4 to 6 months
  • Additional evidence may support early feeding of other allergenic foods

• Skin barrier dysfunction may precede development of allergies

• Evidence for reducing allergies by addressing skin barrier integrity is conflicting
  • Further studies are needed
ANY Questions?
Understanding Food Allergies in Infants and Children: The Symptoms, Diagnoses and Management

Clinical Recommendations for Reducing and Preventing Food Allergies
Hugh A. Sampson, MD, FAAAAAI, and Marion Groetch, MS, RDN

THANK YOU for joining us

Group Viewing Credit
https://pnce.org/gv/57581
<table>
<thead>
<tr>
<th></th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>An Overview of Food Allergies in Children</td>
<td>Stanley A. Cohen, MD, Curriculum Chairperson</td>
</tr>
<tr>
<td>2</td>
<td>Diagnosing Food Allergies in Infants and Children</td>
<td>Jonathan Spergel, MD, PhD</td>
</tr>
<tr>
<td>3</td>
<td>Cow’s Milk Allergy: Mechanisms, Diagnosis and Treatment</td>
<td>David Fleischer, MD, and Carina Venter, PhD, RD</td>
</tr>
<tr>
<td>4</td>
<td>Guidelines for Diagnosis and Management of Food Protein-Induced</td>
<td>Anna Nowak-Węgrzyn, MD, PhD</td>
</tr>
<tr>
<td></td>
<td>Enterocolitis Syndrome</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Eosinophilic Esophagitis: Practical Diagnosis and Management of</td>
<td>Mirna Chehade, MD, MPH</td>
</tr>
<tr>
<td></td>
<td>Pediatric Patients with EoE</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Optimizing Nutrition in Infants at High-Risk for Developing Allergy</td>
<td>Tatyana Hofmekler, MD, MSc</td>
</tr>
<tr>
<td>7</td>
<td>Clinical Recommendations for Reducing and Preventing Food Allergies</td>
<td>Hugh A. Sampson, MD, FAAAAI, and Marion Groetch, MS, RDN</td>
</tr>
</tbody>
</table>
Clinical Recommendations for Reducing and Preventing Food Allergies

Presented by
Hugh A. Sampson, MD
Kurt Hirschhorn Professor of Pediatrics
Department of Pediatrics
Icahn School of Medicine at Mount Sinai

Marion Groetch, MS, RDN
Director of Nutrition Services
Jaffe Food Allergy Institute
Division of Allergy & Immunology
Icahn School of Medicine at Mount Sinai