UT Southwestern Medical Center

Safely Conducting Oral Food Challenges in Practice

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Objectives

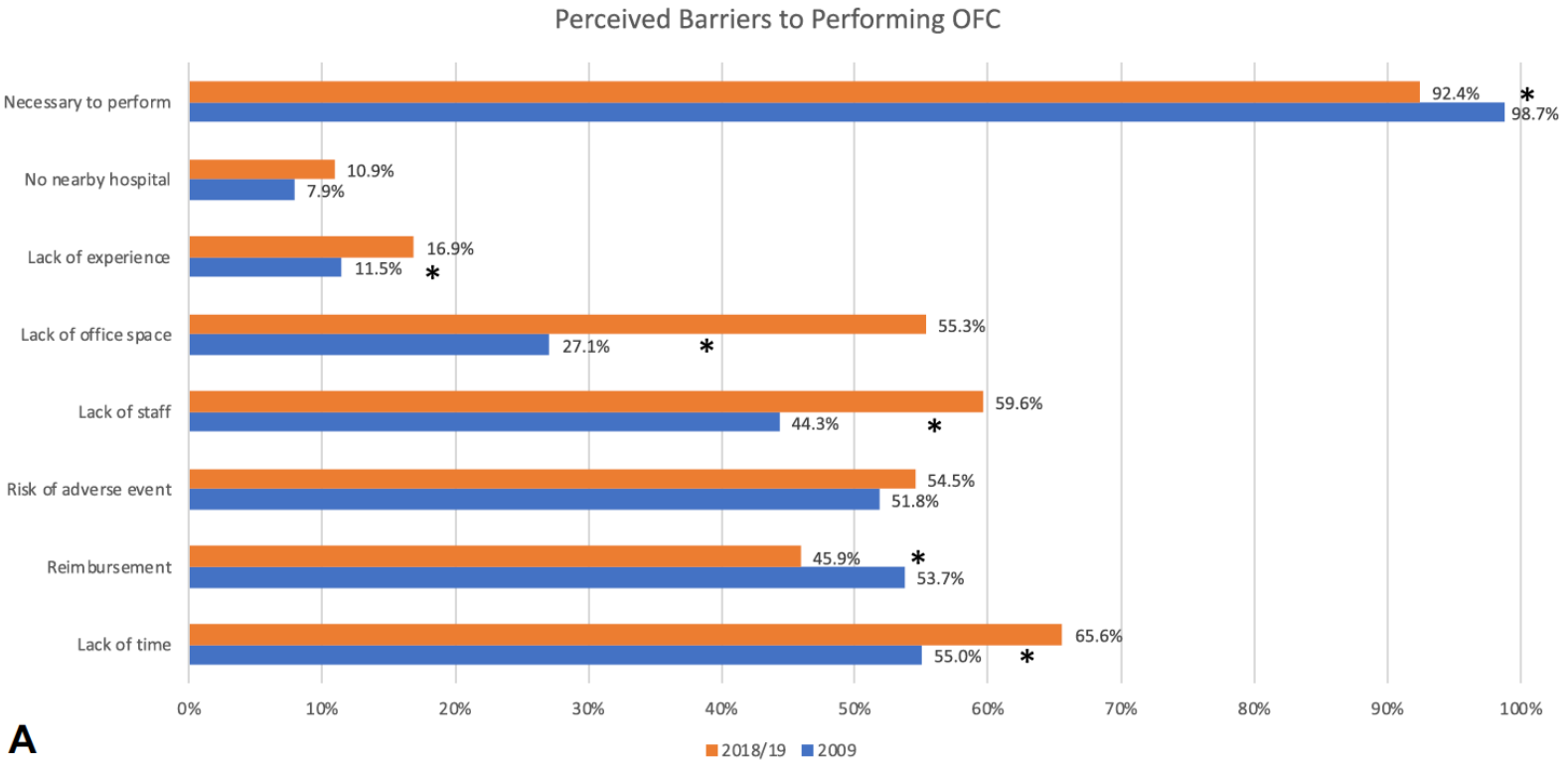
1. Select appropriate patients for an oral food challenge.
2. Identify safety precautions necessary for conducting an oral food challenge.
3. Understand appropriate food vehicles and serving size options for various oral food challenges.

AAAAI Work Group Report: Trends in Oral Food Challenge Practices Among Allergists in the United States

OFC performed in practice (per month), total number	Percent reporting (513 answered)
0	5.46% (28)
1-5	58.09% (298)
6-10	19.30% (99)
11-15	7.21% (37)
16-20	9.94% (51)

Griewe J, et al. J Allergy Clin Immunol Pract 2020;8:3348-55.

AAAAI Work Group Report: Trends in Oral Food Challenge Practices Among Allergists in the United States



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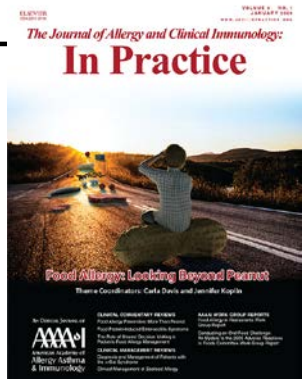

American Academy of Allergy Asthma & Immunology

Conducting an Oral Food Challenge: An Update to the 2009 Adverse Reactions to Foods Committee Work Group Report

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Topics Emphasized

- Patient selection and OFC indications
- Safety considerations
- Psychosocial considerations
- Stopping the OFC and treating reactions
- Challenge options
- Baked Milk and Baked Egg OFCs
- Infant and Adult OFCs
- FPIES OFCs
- Research OFCs
- Blinding recipes
- Post-OFC guidance

Patient selection and OFC indications

- Why perform the OFC?
  - Identify foods concerning for a potential allergic reaction
    - **Family should not introduce at home because of a risk of a reaction**
    - **Family is afraid to introduce at home**
  - Determine whether foods avoided because of misuse of food allergy panel testing, AD or EoE may trigger immediate reaction with reintroduction
  - Dietary expansion
  - Assessing the status of tolerance of cross-reacting foods
  - Assessing the effect of food processing on tolerability

Patient Selection and OFC indications

- Serum IgE testing and/or SPT results are not consistent with history
- Risk based on history and tests is outweighed by the benefit of adding food to the diet

TABLE E1. Predictive values of diagnostic tests used to assess OFC outcomes[E1]

	Serum food-IgE (kU/L)*		SPT Wheal (mm)*	
Food	**~95% Positive OFC**	**~50% Negative OFC†**	**~95% Positive OFC**	**~50% Negative OFC†**
Cow's milk	≥15[E2]	≤2[E3]	≥8[E4]	
	≥5 if younger than 1 y[E5]			
Egg white	≥7[E2]	≤2[E3]	≥7[E4]	≤3[E6]
	≥2 if younger than 2 y[E7]			
Peanut	≥14[E2]	≤2 with and ≤5 without history of peanut reaction[E8]	≥8[E4,E9]	≤3[E9]
Fish	≥20[E2]			

Patient selection and OFC indications

- How important is the food in the diet and will the food be reincorporated?
  - **Might not proceed if…**
    - Fish challenge in vegetarian family
    - Brazil nut tolerance in cashew/pistachio allergic child
  - **Would more strongly consider proceeding if…**
    - Brazil nut challenge for tree nut allergic child might be worthwhile if multi-food allergic and restricted protein choices

Consent

- Documented verbal or signed written consent recommended

TABLE E2. Consent for OFC

PATIENT:
MR NO.:
DATE OF BIRTH:
DATE OF VISIT:
Consent for OFC
You/your child has been offered a medically supervised diagnostic feeding test (oral food challenge). This test is considered the best way to determine whether there is an allergy to the tested food. For the remainder of this consent form "you" will refer to you or your child.
The food challenge involves eating the food in gradually increasing amounts (doses) over time and a period of observation. The amounts offered and timing between the doses may vary depending on your doctor's assessment. The test may take several hours or longer. If your doctor determines that you are having an allergic reaction, feeding will stop and treatment for the allergic reaction will be given. If you have a reaction, you may be watched for additional time.
Benefits and risks of food challenges. The oral food challenge is an accepted medical test. The benefit includes finding out if you have an allergy and understanding your reaction to the food. Your doctor will explain the specific risks for a feeding test to this food. Eating a food to which there is a possible allergy can result in a reaction. Reactions can be mild or severe, including anaphylaxis, a severe, potentially life-threatening allergic reaction. Possible symptoms include throat/mouth itching, swelling, hives, worsening of eczema, nausea, vomiting, stomach pain, diarrhea, wheezing, fainting, and/or a drop in blood pressure. Death is a risk. If a reaction occurs, treatment could include an antihistamine, an injection of epinephrine, an inhaled bronchodilator, steroids, and other medications and treatments. Payment for treatment of adverse events related to this food challenge will occur in the manner you routinely pay for health care.
If an allergic reaction should occur during a food challenge, you will be required to remain under care until the physician believes it is safe for you to go home. In unusual circumstances, you may need to be transferred to an emergency room or hospital unit for further observation/treatment.
Alternatives to an oral food challenge: If you choose to not have an oral food challenge, the safest thing to do is restrict the food in question from your diet.
Signing this consent form indicates that you have read this form (or have had it read to you), that your questions have been answered to your satisfaction, and that you voluntarily agree to participate in this food challenge.

Safety Considerations

- Factors associated with fatal and near-fatal reactions:
  - Peanut, tree nut, fish, shellfish and milk allergies
  - Asthma (regardless of severity)
  - Delayed use of epinephrine
  - Upright posture during assessment of the anaphylactic reaction may contribute to cardiovascular compromise

Safety Considerations

- Patient risk factors that might influence OFC interpretation or reaction severity

TABLE I. Reasons to reschedule or delay an OFC

Consider postponing the OFC if the patient has any of the following:
• Concurrent illness, fever, or active respiratory symptoms (ie, wheeze or cough)
• Used a short-acting β-agonist within the preceding 48 h for cough or wheeze
• Poorly controlled asthma, AD, or allergic rhinitis
• Unstable cardiovascular disease
• Pregnancy
• Beta-blocker therapy
• Patient has not discontinued medications as outlined in Tables II and III

Antihistamine discontinuation

TABLE II. Suppressant effects of antihistamines and medications with antihistamine-like properties

Medication	Recommended last dose based on suppression of SPT wheal diameter*
Antihistamines (oral)	
First-generation H_1-blocking	
Brompheniramine	>2-4 d[7]
Chlorpheniramine	3-6 d[8]
Clemastine	5-10 d[7]
Cyproheptadine	9-11 d[8]
Diphenhydramine	2-5 d[8]
Hydroxyzine	5-8 d[8]
Promethazine	3-5 d[7]
Tripolidine	3-7 d[7]
Second-generation H_1-blocking	
Acrivastine	3 d[7]
Cetirizine	3 d[7]/3-5 d[9]
Desloratadine	7 d[7]
Fexofenadine	2 d[7]/3-5 d[9]
Levocetirizine	Unknown
Loratadine	7 d[7]/3-5 d[9]
H_2-blocking	
Cimetidine	0-2 d[9]
Famotidine	0-2 d[9]
Ranitidine	<1 d[8]
Antihistamine (nasal)	
Azelastine	2 d[8]
Levocabastine	0 d[8]
Olopatadine	Unknown
Antihistamine (ophthalmic)	
Levocabastine	0 d[8]
Olopatadine	Unknown
Atypical antidepressants/sedatives	
Bupropion	0-3 d[9]
Eszopiclone	0-3 d[9]
Mirtazapine	5-7 d[9]
Quetiapine	5-7 d[9]
Trazodone	0-3 d[9]
Zolpidem	0-3 d[9]
Benzodiazepines	
Clonazepam	5-7 d[9]
Diazepam	5-7 d[9]
Lorazepam	5-7 d[9]
Midazolam	5-7 d[9]
Tricyclic antidepressants	
Amitriptyline	5-7 d[9]
Desipramine	2 d[8]
Doxepin	6 d[8]
Imipramine	>10 d[8]
Nortriptiline	5-7 d[9]

Medications that may interfere with OFC interpretation or reaction treatment

Medication	5 half-lives (h)
ACE inhibitors	
Captopril	8.5-11.5 (<1 d)
Enalapril	Children: 25.5-104 (1-4 d) Adults: 175 (7 d)
Lisinopril	70 (3 d)
Quinapril	11.5 (<1 d)
Ramipril	65-85 (3-4 d)
Beta-blockers‡	
Atenolol	Children and adolescents: 17.5-35 (~1 d) Adults: 30-35 (~1 d)
Carvedilol	Children and adolescents: 18 (1 d) Adults: 35-50 (1-2 d)
Labetalol	30-40 (1-2 d)
Metoprolol	15-20 (1 d)
Propranolol	19.5-32 (1 d)
Timolol	10-13.5 (<1 d)
Cromolyn	
Inhaled	6.5-7.5 (<1 d)
Systemic	6.5-7.5 (<1 d)
NSAIDs	
Aspirin	15 (1 d)
Short-acting	
Diclofenac	10 (<1 d)
Ibuprofen	8-10 (<1 d)
Ketoprofen	10-20 (1 d)
Long-acting	
Celecoxib	Children and adolescents: 15-50 (1-2 d) Adults: 55 (2 d)
Meloxicam	Children and adolescents: 63.5 (3 d) Adults: 75-110 (3-5 d)
Naproxen	Children and adolescents: 40-50 (2 d) Adults: 60-85 (3-4 d)
Piroxicam	Children and adolescents: 110-200 (5-8 d) Adults: 250 (10 d)

Medications that may interfere with OFC interpretation or reaction treatment

Medication	$T^1/_2$ (h)	5 half-lives (h)
Proton pump inhibitors		
Esomeprazole	1-1.5	5-7.5 (<1d)
Lansoprazole	0.5-1.5	2.5-7.5 (<1d)
Omeprazole	0.5-1	2.5-5 (<1d)
Pantoprazole	1.27 ± 1.29	6.35 ± 6.45 (<1 d)
Rabeprazole	1-2	5-10 (<1 d)
Short-acting bronchodilator§		
Albuterol	8 h[11]	
Isoproterenol	8 h[11]	
Metaproterenol	8 h[11]	
Terbutaline	8 h[11]	
Medium-acting bronchodilator		
Ipratropium	24 h[11]	
Long-acting bronchodilator		
Salmeterol	Continue at lowest dose possible and on fixed schedule because withdrawal could result in exacerbation.[5] Discontinuation at least 8 h before the OFC has been recommended[1]	
Formoterol		
Oral bronchodilators		
Theophylline (liquid)	12 h[11]	
Theophylline (long-acting)	48 h[11]	
Systemic steroids	7-14 d (disease rebound might confound the interpretation of the OFC result)[5]	

Prolonged high-dose steroids, omalizumab, or possibly other new drugs to control atopic disease are likely to modify challenge outcomes and should be avoided.[5]

No need to discontinue inhaled or intranasal corticosteroids, calcineurin inhibitors, leukotriene antagonists, topical steroids, topical crisaborole, topical pimecrolimus, topical tacrolimus, selective serotonin reuptake inhibitors, or selective norepinephrine reuptake inhibitors.

Psychosocial considerations

- Assess the patient's OFC readiness when deciding when and if to schedule the OFC
- If significant anxiety exists, consider inclusion of mental health professional to provide anxiety management strategies
- Parents should explain the process to the child emphasizing the goal is to see whether the child is or is not allergic to the food
- Avoid using the terms "pass" and "fail" to avoid placing blame on the child

Psychosocial considerations

- Give the child the opportunity to select which toys and activities they want to engage in during the OFC
- Allow the child to select the food challenge option (if possible)
    - Milk challenge: liquid milk, yogurt or ice cream
- Follow-up with patients after positive (i.e., patient reacted) OFC and consider referral to mental health professional for patients who experience long-term stress or anxiety

Pre-OFC Considerations

- No food for at least 4 hours before the OFC
    - If unable to fast for 4 hours then give a light meal approximately half the usual amount 2 hours before the OFC
- Advise parents this is long process and should bring entertainment and leave siblings at home if possible

Pre-OFC Considerations

TABLE E4. Preparing for a food challenge—information and recommendations from your doctor

An OFC or feeding test is the most reliable method for food allergy diagnosis. A food challenge is used to evaluate whether a food allergy has been outgrown or to figure out whether someone truly has a food allergy when the history and allergy test results are unclear. Food challenge visits are very involved, so please read this handout carefully.
What is a food challenge?
An oral food challenge is a medical procedure in which a food is eaten in gradually increasing doses under medical supervision.
How long is a food challenge visit?
Plan to stay between 3 and 6 h in the office; average is about 4 h. Your stay may be longer or shorter, depending on history, type of food allergy, and what happens during the challenge. If you/your child has no symptoms, you/your child will be monitored in our office for 1-2 h after the last dose. In children with a history of FPIES, plan to stay 2-6 h after the food is fully ingested for observation. If you/your child has a reaction during the challenge, monitoring times will vary. If a reaction requires treatment with epinephrine, you/your child may be monitored for several hours after the administration of epinephrine. If a reaction is significant or severe, there is a small chance that you/your child will need to be transferred to an emergency room or be hospitalized for further monitoring or additional medications. Please have a back-up plan in place in case you need to stay the whole day.
How to prepare for a food challenge
You/your child must be well on the day of the challenge. Please call the office to discuss any symptoms of illness, asthma, or allergy. A food challenge may need to be rescheduled if
• You/your child is sick the week of the challenge, eg, fever, infection, or antibiotics.
• You/your child has poorly controlled or worsening of asthma, eczema, or nasal allergy symptoms the week of the challenge, eg, using rescue inhaler within 2-3 d before the challenge, having to blow nose constantly, or active flare of eczema.
Medication guidelines
Stop all antihistamines 3-10 d before the challenge as directed by your doctor. Other medications may be discontinued per your doctor's instructions.
Continue all asthma steroid preventative inhalers and nasal steroid sprays (fluticasone, budesonide, beclomethasone, flunisolide, mometasone, ciclesonide, triamcinolone). If your asthma preventative inhaler has salmeterol or formoterol in it, do not use this inhaler 8 h before the challenge. Do not use a rescue inhaler (albuterol, xopenex) preventively (eg, before exercise to prevent symptoms) 8 h before the challenge. Please always use a rescue inhaler if needed for symptoms and then let the office know.
Never avoid treating allergy or asthma with rescue medications because a food challenge is approaching. If you/your child needs to use a rescue inhaler, an antihistamine, or even epinephrine, please use the medicine and then call the office to discuss the symptoms in case the challenge should be postponed.

Emergency Preparedness

- Perform in a monitored setting
- Assure appropriate meds have been discontinued
- Vital signs obtained before starting OFC and physical exam for any perceived change
- Emergency meds should be readily available, and doses calculated
    - IM epinephrine
    - Albuterol
    - H1 antihistamines
    - Supplemental oxygen
    - Nebulized epinephrine
    - IV fluids
- Emergency care plan in place, including expedient access to emergency care

Stopping the OFC

The OFC should be stopped if any **1** of the following symptoms is present during the OFC:

Skin
- ≥3 urticarial lesions
- Angioedema
- Confluent erythematous, pruritic rash

Respiratory
- Wheezing
- Repetitive cough
- Difficulty breathing/increased work of breathing
- Stridor
- Dysphonia
- Aphonia

Gastrointestinal
- Vomiting alone not associated with gag reflex
- Severe abdominal pain (such as abnormal stillness, inconsolable crying, or drawing legs up to abdomen) that persists for ≥3 min

Cardiovascular
- Hypotension for age not associated with vasovagal episode

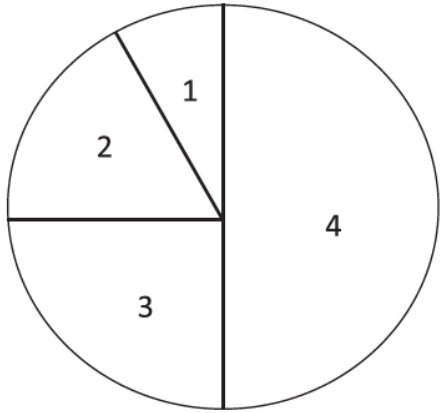
If 2 or more of the following are present, the OFC should be stopped:

Skin
- Persistent scratching for ≥3 min

Respiratory
- Persistent rubbing of the nose or eyes for ≥3 min
- Persistent rhinorrhea for ≥3 min

Gastrointestinal
- Diarrhea

Food Options & Portion Sizes

Four Dose Protocol	Six Dose Protocol
Divide the serving as outlined below. Dose 1 = 1/12th of the total serving Dose 2 = 1/6th of the total serving Dose 3 = 1/4 of the total serving Dose 4 = 1/2 of the total serving 	Dose 1 = 1% of total dose Dose 2 = 4% of total dose Dose 3 = 10% of total dose Dose 4 = 20% of total dose Dose 5 = 30% of total dose Dose 6 = 35% of total dose

Food Options & Portion Sizes

- **Goal dose**: at least 4 - 5 grams of protein cumulative (final dose 3 grams) OR approximate age-appropriate serving size

TABLE V. Age-appropriate portion sizes for open OFC

Allergen	Food	Protein content per serving size	Age				
			4-11 mo	1-3 y	4-8 y	9-18 y	19+ y
Egg	French toast (1 egg per 1 slice of bread)*	6 g if made with 1 large egg	½-1 slice	½-1 slice	1 slice	1-2 slices	1-2 slices
	Hard-boiled or scrambled egg	6 g/1 large egg	½-1 egg	½-1 egg	1 egg	1-2 eggs	1-2 eggs
Fish	Cooked fish†	6 g/1 oz	½-1 oz	1 oz	1 oz	2-3 oz	3-4 oz
Grains	Cooked cereal	5 g per 1/4 cup dry (oatmeal or Cream of Wheat)	¼ cup	¼ cup	⅓-½ cup	½-1 cup	½-1 cup
	Cooked pasta*/rice	3 g per 1/2 cup	¼ cup	¼ cup	⅓-½ cup	½-1 cup	½-1 cup
	Infant cereal	1-2 g per 1/4 cup	¼-½ cup	¼-½ cup			
	Muffin or roll bread*	4-6 g/muffin or roll	¼-½ piece	½ piece	½-1 piece	1 piece	1 piece
	Ready-to-eat cereal	2-6 g/1 cup	¼-⅓cup	¼-⅓ cup	½-¾ cup	¾-1 cup	¾-1 cup
	Slice bread	2-4 g/slice	¼-½ slice	½ slice	½-1 slice	1-2 slices	2 slices
Milk	Infant formula	2-3 g/5 oz	4-8 oz				
	Milk	8 g/8 oz		4-8 oz	4-8 oz	8 oz	8 oz
	Cottage cheese	10-14 g/4 oz	¼-½ cup	¼-½ cup	½-1 cup	½-1 cup	1 cup
	Hard cheese	6-8 g/1 oz	¼-½ oz	½ oz	1 oz	1 oz	1½ oz
	Yogurt (NOT Greek style)	8 g/8 oz	¼-½ cup	¼-½ cup	½-1 cup	½-1 cup	½-1 cup
Peanut	Peanut (whole)	2 g/~8 peanuts			16 pieces	16 pieces	16 pieces
	Peanut butter	3 g/1 tbsp	1 rounded tbsp‡	1-2 tbsp	1-2 tbsp	2 tbsp	2 tbsp
	Peanut flour or peanut butter powder	3 g/1 tbsp original or 2.25 g/1 tbsp chocolate flavor	1 rounded tbsp‡	1-2 tbsp	1-2 tbsp	2 tbsp	2 tbsp
	Peanut/chocolate candy cups (full-size)	0.875 g/1 cup		1-2 candy cups	1-2 candy cups	2-3 candy cups	2-3 candy cups

Baked Milk & Baked Egg OFCs

- Most children with IgE-mediated reactions to milk and egg tolerate baked forms of these foods
- Regular ingestion of baked products may promote development of tolerance to the native form of the food
- SPT and specific IgE values have not consistently predicted who will react during OFC
    - Online appendix summarizing LRs from published studies

Baked Milk & Baked Egg OFCs

TABLE E8. Muffin recipes (4 recipes)[E28]

BE muffin recipe
Yield: 6 muffins
Ingredients:
Dry ingredients
1 cup all-purpose wheat flour
½ cup sugar
¼ tsp salt
1 tsp baking powder
Wet ingredients
2 tbsp canola oil (or other tolerated vegetable oil)
½ tsp vanilla extract
2 large eggs, beaten
½ cup rice milk (may use other tolerated milk or milk substitute)
1. Preheat oven to 350°F. Bake muffins only in an oven that is completely preheated to 350°F.
2. Line a muffin pan with 6 muffin liners. Use aluminum or parchment paper muffin liners or alternatively, you may grease the muffin tins with Pam or safe margarine (or butter if not allergic to milk).
3. Stir together the liquid ingredients until well combined: milk, canola oil, vanilla extract, and egg. Set aside.
4. In a separate mixing bowl, mix together the dry ingredients (flour, sugar, salt, baking powder).
5. Add liquid ingredients to dry ingredients all at once and gently stir with a large spoon (about 15-20 light strokes) until wet and dry ingredients are just combined. Do not overstir. Some small lumps may remain.
6. Divide the batter into the 6 prepared muffin liners. Depending on the size of your muffin tin, you may need to fill the muffin liners all the way to the top.
7. Bake 30-35 min or until golden brown and firm to the touch. Cool completely before serving.
If you make more than 6 muffins, please note how many muffins you made and bring at least 2 muffins with you on the day of the challenge.

Key Points

- Cook muffins rather than cake
- Ensure product is well-cooked before OFC
- Do not challenge at home
- Proceed with OFC cautiously (e.g., 20 to 30 mins between doses)

Baked Egg & Baked Milk OFCs

TABLE E9. Guidance if BE is tolerated[E28]

Instructions for introducing BE at home—after the physician-supervised oral food challenge and when approved by your doctor:
When your child has passed the BE challenge he or she will be able to eat extensively baked products with egg as an ingredient. Should your child develop an allergic reaction to the food that contains BE, please record the offending food, amount eaten, preparation technique, and symptoms, and contact our office at your earliest convenience to review the reaction.
Your child MAY NOW EAT the following:
☐ Store-bought baked products with egg/egg ingredients listed as the third ingredient or further down the list of ingredients
☐ Home-baked products that have no more than $^1/_3$ of a BE per serving. For example, a recipe that has 2 eggs/batch of a recipe that yields 6 servings*
☐ Remember to check store-bought products and ingredients based on your child's food allergies in order to avoid a reaction to other allergens
☐ All baked products must be baked throughout and not wet or soggy in the middle
Your child SHOULD CONTINUE TO AVOID unbaked egg and egg-based foods such as:
☐ Baked products with egg listed as first or second ingredient
☐ Caesar salad dressing
☐ Custard
☐ Eggs in any form such as hard or soft boiled, scrambled, or poached
☐ Egg noodles
☐ French toast/pancakes
☐ Home-made waffles
☐ Frosting-containing egg
☐ Ice cream
☐ Mayonnaise
☐ Quiche

*Serving sizes are specified in the nutrition information section of the food label or determined by the yield of the recipe.

TABLE E10. Guidance if BM is tolerated[E28]

Instructions for introducing BM at home—after the physician-supervised OFC and when approved by your doctor:
When your child has passed the BM challenge, he or she will be able to eat extensively baked products with cow's milk as an ingredient. Should your child develop an allergic reaction to the food that contains BM, please record the offending food, amount eaten, preparation technique, and symptoms, and contact our office at your earliest convenience to review the reaction.
Your child MAY NOW EAT the following:
☐ Store-bought baked products with cow's milk/cow's milk ingredient listed as the third ingredient or further down the list of ingredients
☐ Home-baked products that have no more than 1/6th cup of cow's milk per BM serving. For example, a recipe that has 1 cup cow's milk per batch of a recipe that yields 6 servings*
☐ Remember to check store-bought products and ingredients based on your child's food allergies in order to avoid a reaction to other allergens
☐ All baked products must be baked throughout and not wet or soggy in the middle
Your child SHOULD CONTINUE TO AVOID unbaked milk and cow's milk–based foods such as:
☐ Baked products with cow's milk listed as first or second ingredient
☐ Products that may have a cow's milk ingredient that has not been baked such as a cow's milk ingredient containing frosting on a cookie or cupcake or a cheese flavoring on a cracker that may not have been baked (eg, flavorings may be applied topically after the product is baked)
☐ Milk chocolate chips that will melt during baking but not "bake." Please continue to use cow's milk–free chocolate chips
☐ Regular milk or dairy in any form including whole, low-fat, nonfat, or skimmed cow's milk, lactose-free products, dry milk powder, yogurt, sour cream, butter, hard and soft cheeses, ice cream/sherbet, butter, etc
☐ Frostings with a cow's milk ingredient
☐ French toast/pancakes
☐ Home-made waffles
☐ Cooked milk products that are not baked such as puddings

*Servings are specified in the nutrition information section of the food label or determined by the yield of the recipe.

Infant OFCs

- Infant must be tolerating other foods, including the food and texture to be used as a vehicle during the OFC
- Infant should be in good overall health at the time of the OFC (e.g., afebrile, AD well-controlled)
- Infant should eat only a light meal no sooner than 2 hours from the scheduled OFC
- Staff should be familiar with unique challenges related to medical treatment of infants (e.g., non-verbal signs of reactivity, infant feeding, medication dosing)
- Do not schedule during nap time

Infant OFCs

TABLE II. Emergency medications for infants

Medication	Dose
Epinephrine (1:1000 concentration)	0.01 mg/kg IM in the mid-outer thigh in health care settings OR 0.15 mg autoinjector IM in the mid-outer thigh in community settings[4]
Albuterol nebulization	0.15 mg/kg every 20 min × 3 doses (minimum of 2.5 mg per dose) over 5-15 min
Albuterol MDI inhalation	2 puffs, 90 mcg/puff, with face mask
Oxygen	8-10 L/min via face mask
Diphenhydramine	1.25 mg/kg/dose PO/IM/IV
Cetirizine	2.5 mg PO
Normal saline (0.9% isotonic solution) or lactated ringers	20 mL/kg/dose administered over 5 min
Steroids	Prednisolone 1 mg/kg PO OR Solu-Medrol 1 mg/kg IV

IM, Intramuscular; *IV*, intravenous; *MDI*, metered-dose inhaler; *PO*, by mouth.

TABLE III. Special considerations for anaphylaxis in infants[5]

Age	Vitals
When is it hypotension?	Systolic blood pressure (mm Hg)
Infants (1-12 mo)	<70
1-10 y	(Age × 2) + 70
When is it tachypnea?	Respiratory rate
2-12 mo	≥50 breaths/min
1-4 y	≥40 breaths/min
When is it tachycardia?	Heart rate
<2 y	>160 beats/min

Infant OFCs – Post-OFC Instructions

- Ingests full amount and does not have a reaction
  - For peanut, provide at least 2 grams of protein (e.g., 2 tsp PB) at least 3 times per week
- Ingests more than half but refuses the remainder
  - Give equivalent amount at home and increase ad lib
- Does not ingest at least half
  - Inconclusive; Repeat in 1 to 2 weeks
- Has a reaction
  - Continue strict avoidance

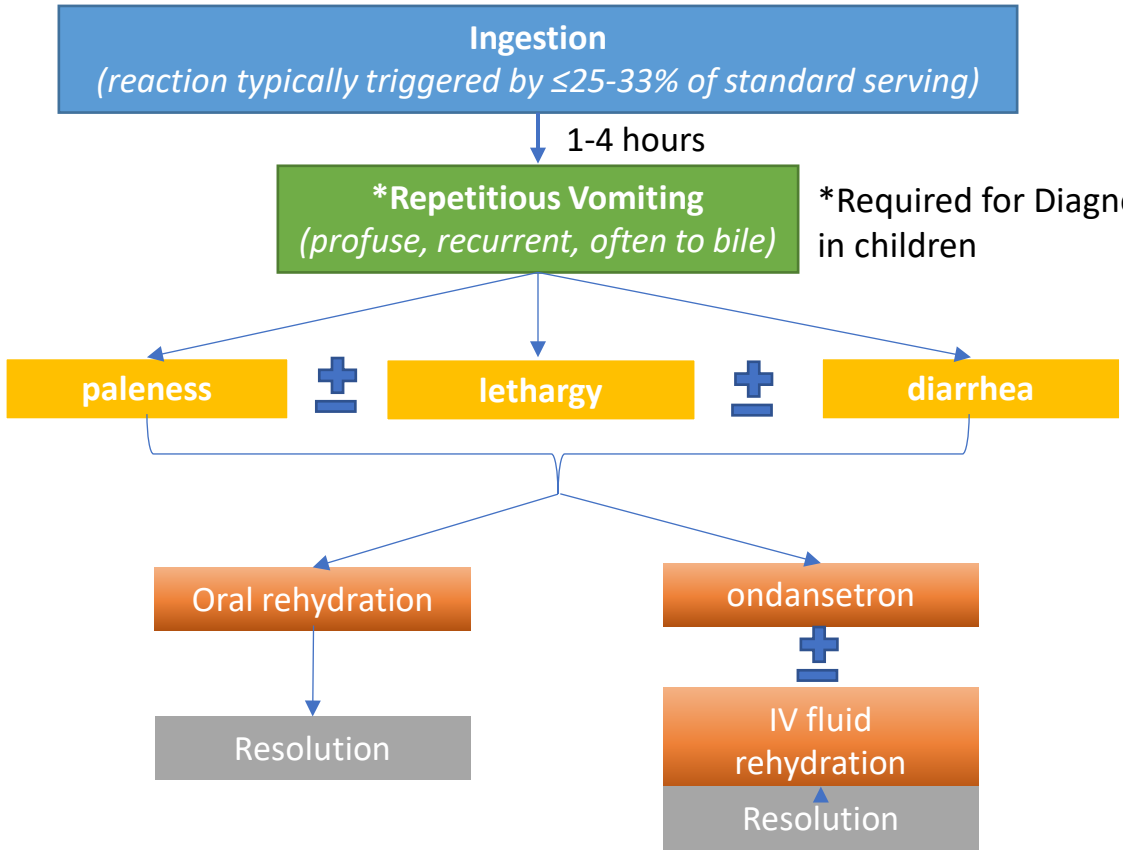
Adult OFCs

- Be aware of coexisting medical conditions that may interfere with interpretation
  - Chronic idiopathic urticaria
  - Psychiatric conditions
  - Unstable underlying cardiovascular disease
  - Pregnancy
- Subjective or isolated upper airway symptoms may represent factitious stridor, globus sensation or vocal cord dysfunction
  - Direct visualization via laryngoscopy may be helpful
- Consider co-factors to potentiate reaction (e.g., exercise, NSAIDs)
- Consider FPIES or alpha-gal sensitization if history of delayed reactions

Food Protein Induced Enterocolitis Syndrome (FPIES)

- Non-IgE-mediated food allergy that most commonly affects infants and resolves by school age for most affected children
- Cow's milk, soy, rice and oat are the most common triggers in the US
    - Any food may be implicated, including fruits and vegetables
- No reliable biomarkers confirm diagnosis
    - Diagnosis is reliant on clinical history and oral food challenge

FPIES Presentation, Diagnosis, & Reaction Treatment



Bird JA, et al. Ann Allergy Asthma Immunol 126:506-15.

International consensus guidelines for the diagnosis and management of food protein–induced enterocolitis syndrome: Executive summary—Workgroup Report of the Adverse Reactions to Foods Committee, American Academy of Allergy, Asthma & Immunology

Anna Nowak-Węgrzyn, MD, Mirna Chehade, MD, Marion E. Groetch, MS, RDN, Jonathan M. Spergel, MD, PhD, Robert A. Wood, MD, Katrina Allen, MD, PhD, Dan Atkins, MD, Sami Bahna, MD, PhD, Ashis V. Barad, MD, Cecilia Berin, PhD, Terri Brown Whitehorn, MD, A. Wesley Burks, MD, Jean-Christoph Caubet, MD, Antonella Cianferoni, MD, PhD, Marisa Conte, MLIS, Carla Davis, MD, Alessandro Fiocchi, MD, Kate Grimshaw, PhD, RD, RNutr, Ruchi Gupta, MD, Brittany Hofmeister, RD, J. B. Hwang, MD, Yitzhak Katz, MD, George N. Konstantinou, MD, PhD, MSc, Stephanie A. Leonard, MD, Jennifer Lightdale, MD, Sean McGhee, MD, Sami Mehr, MD, FRACP, Stefano Miceli Sopo, MD, Giovanno Monti, MD, PhD, Antonella Muraro, MD, PhD, Stacey Katherine Noel, MD, Ichiro Nomura, MD, Sally Noone, RN, MSN, Hugh A. Sampson, MD, Fallon Schultz, MSW, LCSW, CAM, Scott H. Sicherer, MD, Cecilia C. Thompson, MD, Paul J. Turner, MD, Carina Venter, RD, PhD, A. Amity Westcott-Chavez, MA, MFA, and Matthew Greenhawt, MD, MBA, MSc

- Age of onset: Typically, before 9 m/o
- **Acute FPIES**: Occurs with intermittent food exposures. Growth is normal, and child is asymptomatic during food trigger elimination.
- **Chronic FPIES**: Occurs with **daily ingestion** of the food;
  - symptoms include intermittent emesis, chronic diarrhea, poor weight gain, or FTT.
  - return to their usual state of health within 3-10 d of switching to a hypoallergenic formula
  - Subsequent feeding of the offending food after a period of avoidance results in acute symptoms.

Food Protein Induced Enterocolitis Syndrome (FPIES)

- OFCs may be necessary to:
  - Confirm diagnosis
  - Safely introduce high-risk foods (e.g., wheat introduction in oat/rice-reactive patient)
  - Evaluate if natural tolerance has developed
    - Typically performed 12 to 18 months after the most recent reaction

Oral Food Challenge for FPIES in Practice—A Survey: Report from the Work Group on FPIES Within the Adverse Reactions to Foods Committee, FAED IS, AAAAI

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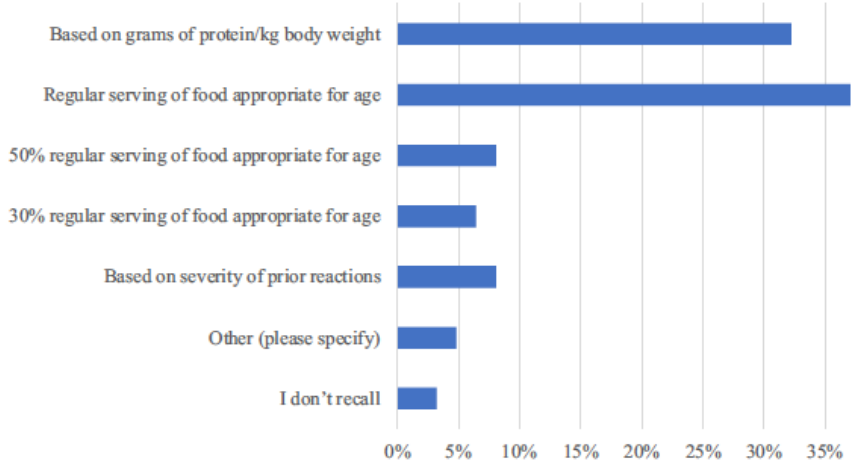
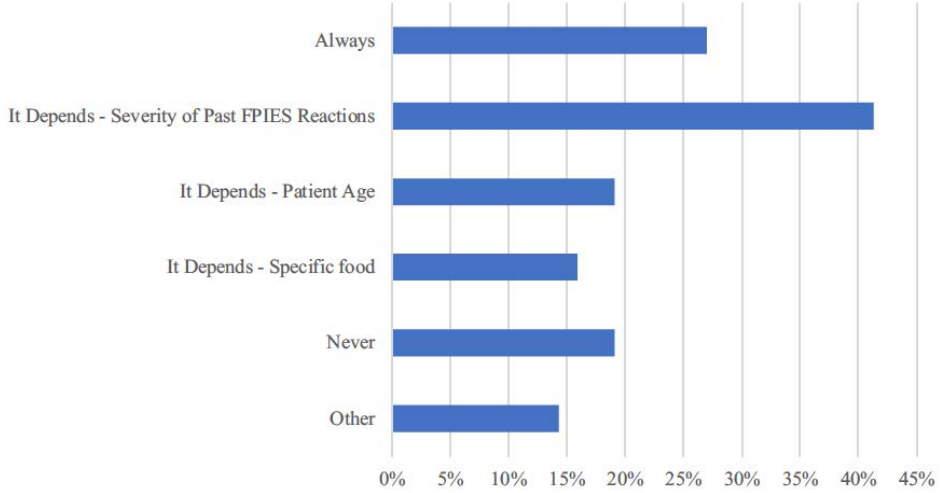
- 58% of respondents performing FPIES OFC in practice
- 51% of respondents in private practice setting

- May need an IV in place
  - At least 15% of reactions may result in hypotension
  - Consider in patients with a history of a severe reaction requiring IV fluid rehydration or in those with anticipated difficult emergency IV access





J Allergy Clin Immunol 2021. 9:3608-14.

Food Protein Induced Enterocolitis Syndrome (FPIES)

- Various protocols have been published but none validated by large studies
- Preparation:
  - Calculate emergency med doses:
    - Normal saline (20 ml/kg/dose over 5 to 10 minutes)
    - Ondansetron IV or IM
    - Glucocorticoids
- Administration
  - 0.06-0.6 g/kg body weight of food protein as a single dose or in 3 equal doses with 15 mins between each dose
  - Do not exceed 3 grams of food protein or 10 g of total food (100 ml of liquid)
  - Give at least 1/3 of serving size or 25% of total dose and increase to full serving over subsequent days (under observation or at home)
    - Most patients will react with 25-33% of total dose
- Observation
  - At least 2-4 hours after last dose with slow introduction of food at home over several days*

Research OFCs

- Purpose:
  - Establish diagnosis
  - Document eliciting dose threshold
  - Determine change in threshold after treatment with investigational product

Patient has objective reaction after ingestion of 100 mg dose

Post-challenge Guidance

- Negative OFC (e.g., patient tolerated the food)
  - Avoid the food for the remainder of the day
  - Encourage the patient to ingest the food in a manner typical of dietary consumption, at least eating it periodically
  - Update emergency treatment plans and school paperwork
- Positive OFC (e.g., patient reacted to the food)
  - Continue strict avoidance of the food
  - Keep activity minimal for the remainder of the day
  - Ensure patient has auto—injectable epinephrine
  - Reinforce emergency treatment plan
  - Normalize and validate anxiety concerns

Post-challenge Guidance

TABLE E15. Recommendations following a positive OFC (ie, individual reacts to the challenge food)

You/your child had a reaction during a food challenge—Recommendations from your doctor
You/your child did not tolerate the challenge food today. This means you/your child is still allergic to the food.
Activity level should be minimal for the rest of the day. Resume normal activity tomorrow.
You/your child's next meal should consist of foods unlikely to cause stomach discomfort because this may be confused with a delayed allergic reaction.
Please make sure you/your child has epinephrine available for the rest of the day.
Please monitor yourself/your child for the rest of the day. Rarely, you/your child may develop a delayed allergic reaction hours after eating the food. If you/your child has symptoms of an allergic reaction such as hives, cough, breathing problems, vomiting, or diarrhea later today, treat according to your emergency action plan first and go to the emergency department.
You/your child must continue to avoid the challenge food and carry epinephrine autoinjectors at all times.
Reminders about epinephrine:
Always have 2 epinephrine injectors available at all times.
Practice how to use epinephrine.
Make sure the school or day care has 2 epinephrine autoinjectors.
Resume any medications held for the food challenge. Return for Allergy follow-up as instructed by your doctor.
It is normal to feel disappointed after experiencing a reaction during a food challenge. However, it also can be a valuable learning experience in helping you/your child recognize symptoms of an allergic reaction and experience the effectiveness of immediate treatment with epinephrine. For parents, try to be as encouraging as possible when discussing the experience with your child. Please do not use the word "fail" in front of your child. Rather, praise your child for participating in the food challenge and helping to answer the question of whether or not he/she is allergic to the food. It is also possible that you/your child will experience increased worry about food allergy after an allergic reaction. This is also normal, and most patients typically feel better in a few days. If you/your child continue to feel more worry than is typical for you/your child, contact your doctor or mental health professional.
If you have any questions or concerns, please call _____.

Managing Food Allergy When the Patient Is Not Highly Allergic

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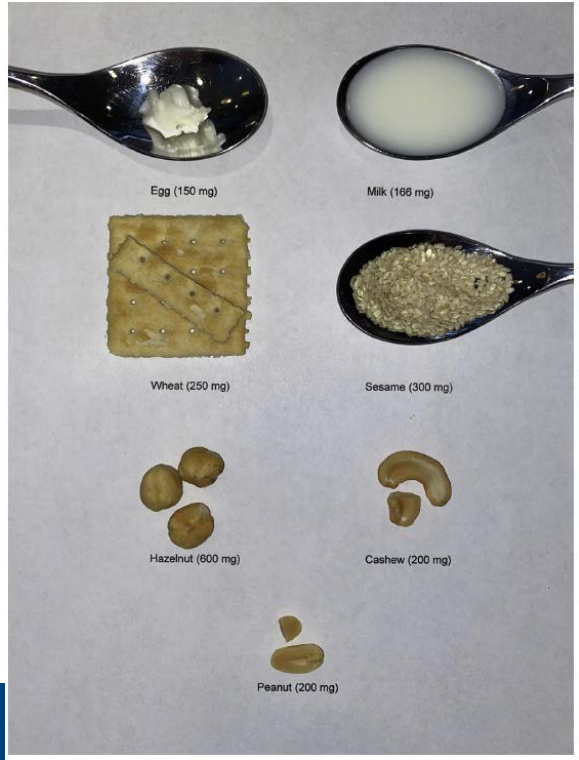

- ED for 50% of allergic people
  - **HALF of people allergic will be able to ingest more than this amount!**
- Potential approaches
  - Avoidance
    - Reduce risk but impair HRQoL
  - Allow PAL products
    - ≤5.8 mg for PN (up to 45 mg), <0.26 mg for E, ≤7.3 mg for M (up to 620 mg)
    - Reduce restrictions but potentially increased risk
  - Allow minor, periodic dietary modifications
    - E.g., Permit sesame seeds but not tahini or hazelnut spread but not hazelnuts
    - Improve QoL but threshold stability is uncertain
  - Prescribe subthreshold ingestion
    - Safety and efficacy of daily ingestion of subthreshold OIT unknown

Conclusions

- OFC Work Group Report Update is intended to provide clarification to the OFC process and clinically useful tools
    - Consent forms and safety considerations
    - Patient handouts for preparation for a challenge and post-challenge instructions
    - Thorough table of food portion sizes
    - Updated antihistamine discontinuation table and contraindicated medication lists
    - Guidance for baked egg and baked milk challenges
    - Guidance for infant, adult and FPIES challenges