EoE Essentials: Overcoming Risk for Nutrition Deficiencies and Malnutrition for Infants and Children with EoE

Funding from non-CPE revenue for CPE planning, development, review, and / or presentation has been provided by Nutricia North America

Meghan McNeill, RD, LD
Registered Dietitian II
Food Allergy and Eosinophilic GI Disorders
Cincinnati, Ohio

Disclosures

- Disclosures
  - Honorarium provided by Nutricia North America

The opinions reflected in this presentation are those of the speaker and independent of Nutricia North America

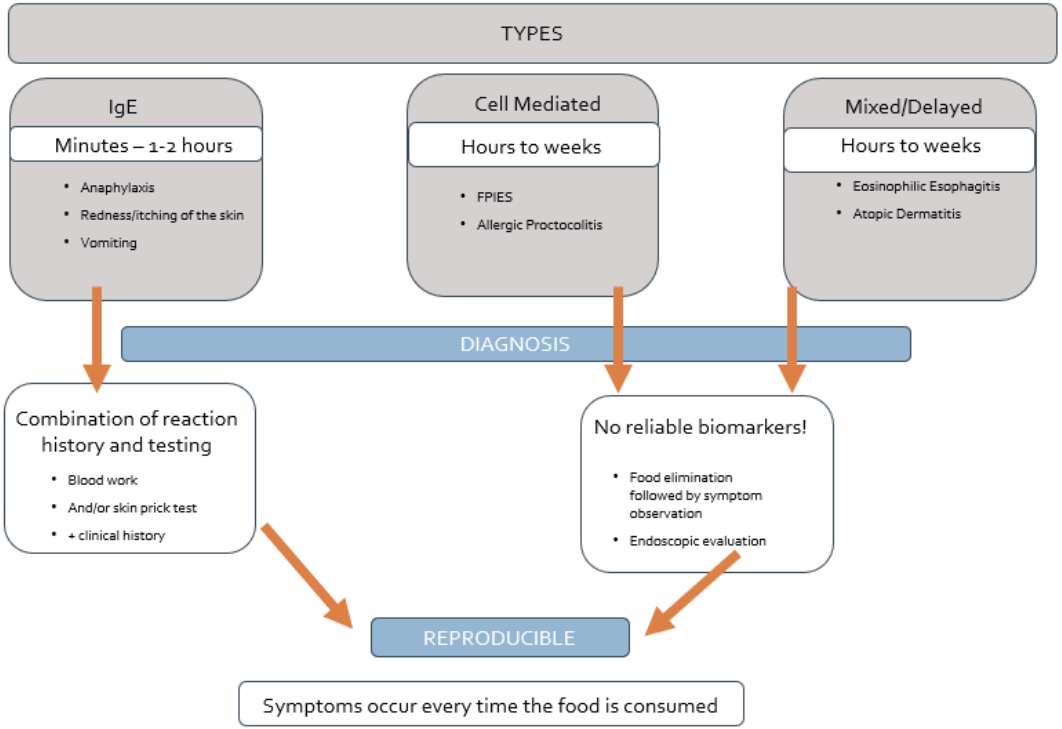
Learning Objectives

- 1. Identify and recognize the symptoms and clinical presentation of eosinophilic esophagitis (EoE) in patients
- 2. Discuss alternative nutrition interventions for patients who cannot use or prefer to not use pharmacological treatments
- 3. Review challenges and strategies for incorporation formula into the diet of infants and older children with EoE

EOSINOPHILIC ESOPHAGITIS (EoE)

A REVIEW

What type of food allergy is EoE?



What is Eosinophilic Esophagitis (EoE)?

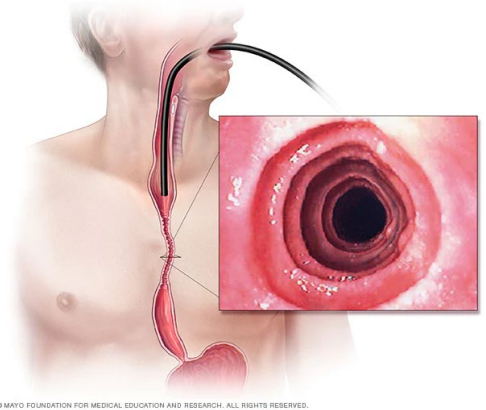
- What is EoE?
  - Chronic immune system disease
  - Build of white blood cells (eosinophils) in the lining of the esophagus
    - Cause by foods, allergens
    - Can lead to swallowing difficulties or cause food to get stuck when you swallow

Signs and Symptoms

- Signs and Symptoms (will vary with age)
  - **Infants and toddlers:** food refusal, poor growth, vomiting, reflux
  - **School aged children:** poor/decreased appetite, recurring abdominal pain, trouble swallowing, food getting stuck in esophagus
  - **Teen & Adults:** difficulty swallowing dry/dense solid foods

EoE Diagnostic Criteria

- Diagnosis:
  - Upper Gastrointestinal endoscope
  - Biopsy: **>15 eosinophils per cell**



EoE TREATMENT OPTIONS

EoE Treatment Options

- Medication
- Food Elimination
- Combination: Medication & Food Elimination

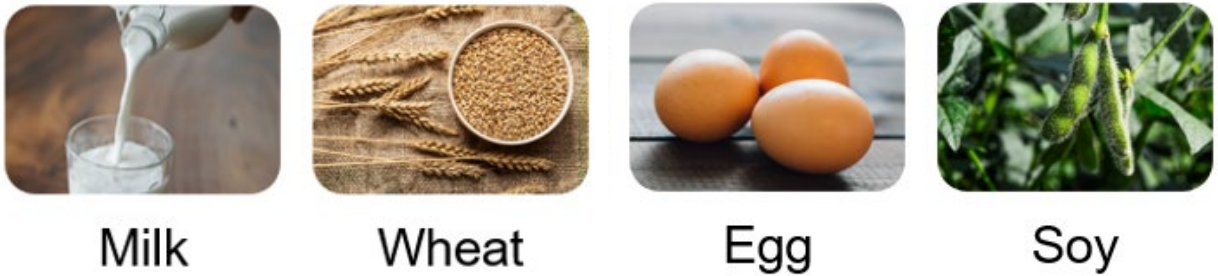
Medication

- High Dose Proton Pump Inhibitors
  - Take 20-30 minutes before a meal
- Topical Swallowed Steroids
  - NPO 30 minutes after
- Biologics: example –Dupixent
  - Given by injection pen once every 1-2 weeks

Cochrane Database Syst Rev. 2023 Jul 20;2023(7):CD004065

Empiric Elimination

- Milk
- Wheat
- Milk & Wheat
- 4FED
  - Milk, Wheat, Egg, Soy
- 6FED
  - Milk, Wheat, Egg, Soy, Peanuts, Tree nuts, Fish, Shellfish



Food elimination therapy can have many different looks…

Any combination of the following:

EoE

IgE allergy

Milk

Wheat

Egg

Soy

Peanuts

Tree nuts

Fish

Shellfish

Beyond 6 Food Elimination

- Beef
- Corn
- Chicken
- Potato
- Pork
- Rice
- Legumes

ELEMENTAL DIET

SOLE SOURCE NUTRITION; AMINO ACID BASED FORMULA + ELEMENTAL SAFE INGREDIENTS

Allowable Ingredients

Sugar
Dextrose
Cream of Tartar
Corn syrup, High fructose corn syrup (HFCS), corn syrup solids

Sucrose
Maltodextrin
Sodium Nitrate
Artificial colors including: FD&C red, yellow, blue

Salt
Artificial flavors
Potassium Sorbate
Heat pressed oils: Soybean, corn, canola, vegetable, Palm, Crisco

Citric Acid
Malic Acid
Baking Soda
Acesulfame K
Sucralose (Splenda)
Aspartame

Soy Lecithin
Tartaric Acid
Calcium Stearate
JR Watkins artificial flavor extracts: coconut, vanilla, caramel

Trace Ingredients to Avoid

Natural Flavors
Cornstarch
Locust bean gum
Mint oils/extracts
Gelatin
Baking powder (contains cornstarch)

Brown Sugar
Carrageenan
Xanthan gum
Spices/Seasonings
Caramel color
Powdered sugar (contains cornstarch)

Honey, Maple syrup
Pectin
Natural flavors
Cinnamon
Food Starch
Natural colors (e.g., annatto)

Chewing Gum
Guar gum
Yeast
Black pepper
Molasses
Expeller and cold-pressed oils

Reintroducing Foods

elimination isn't the end of the road

- **Empiric Elimination**
  - Introduction of 1 foods at a time
  - 1 serving at least 5 times per week
  - Duration of trial: 3 months
    - Wheat - 6 month trial
  - Verdict: based on scope + biopsy

- **Elemental Diet**
  - Versatility of a food is key early
    - Examples: Rice, potato, apple
  - Can lump together 1-4 ingredients/foods
  - Top 8 allergens still trialed individually
    - Other foods may be trialed individually based on pt history

Food Trials

- Individual patient history
  - IgE allergies
  - Other medical considerations
  - Geographic considerations
  - Dietary preferences: vegan, religious considerations
- Interest in eating a specific food

Photo credit: https://www.foodsafety.gov/blog/avoiding-food-allergy-reactions

How to decide on treatment

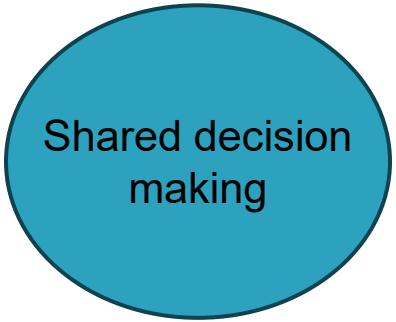
- Patient medical history
- Previous trials for EoE
- Risk & benefits
- Feasibility

The Dietitian's Role

- Label reading
- Cross contamination
- Eating out at restaurants
- Nutritional adequacy
- Diet Diversity
- Quality of life

Medical Nutrition Therapy

- Step 1: assessment of nutritional status
  - Anthropometrics
  - Food intake
  - Sources of nutrients
- Step 2: eliminate dietary antigens
  - Label reading
  - Food substitutions
- Step 3: individualize to meet nutritional needs on an elimination diet
  - Vitamin mineral supplementation?
  - Formula?



Potential Nutrition Deficiencies

Foods	Main nutrients
Cow's milk	Protein, calcium, magnesium, phosphorus, vitamins A, B_6, B_{12}, D, riboflavin, pantothenic acid (iodine in some countries)
Soy	Protein, calcium, phosphorus, magnesium, iron, zinc, thiamin, riboflavin, vitamin B_6, folate
Eggs	Protein, iron, selenium, biotin, vitamins A, B_{12}, pantothenic acid, folate, riboflavin
Wheat	Carbohydrate, zinc, selenium, thiamin, niacin, riboflavin, folic acid, iron, magnesium, dietary fiber
Peanut/tree nuts	Protein, selenium, zinc, manganese, magnesium, niacin, phosphorus, vitamins E and B_6, alpha linolenic acid, and linoleic acid
Fish/shellfish	Protein, iodine, zinc, phosphorus, selenium, niacin Fatty fish: vitamins A and D, omega-3 fatty acids

Groetch M, et al. JACI Pract 2017.

Food Group Considerations

TABLE IV. Type and volume of nutrient-dense foods to include in the pediatric diet

Food group	Daily servings	Food examples	Recommended serving size per age		
			1-3 years	4-8 years	>8 years
Grains	6	Alternative grains such as rice, corn, potato, gluten-free oats, quinoa, millet, amaranth, teff, sorghum, and buckwheat	¼-⅓ cup	½ cup	½ cup
		Breads, cereals, crackers, baked goods made from alternative whole grains	¼-½ slice	¾ slice	1 slice
Fruits/vegetables	5	Fresh or frozen, prepared without allergenic ingredients	¼ cup	½ cup	½ cup
Dairy or milk substitute	3-4	Fortified milk alternatives (drinks based on rice, coconut, hemp, flax) Amino acid-based formulas	4 fluid ounces	6 fluid ounces	8 fluid ounces
Proteins	2-3	Fresh or frozen meats (poultry, beef, pork, lamb)	1 ounce	2 ounces	3 ounces
		Dried legumes (peanut and soy may be excluded)	2-4 Tbsp	¼-⅓ cup	½ cup
Fats and oils	3 (depends on energy needs)	Milk- and soy-free margarine and vegetable oils (olive, canola, refined soybean oil)	1 tsp	1 tsp	1 tsp

All portion sizes are for US foods and measures. A US cup is equivalent to 237 mL; 1 fluid ounce to 29.5 mL; 1 tablespoon (tbsp) to 15 mL; and 1 teaspoon (tsp) to 5 mL. 1 ounce is equivalent to 28.3 g. 1 cup of fruit is equivalent to 1 large banana, 8 strawberries and 2 large plums. 1 cup of vegetables is equivalent to 10 broccoli florets, 12 baby carrots, or 1 large sweet potato.

Quality of Life

- Facilitating normalization of diet
- Finding food options to promote long-term compliance
- Help patient take ownership
- Serving as a reliable source
- Minimizing anxiety and fear related to food
- Label Reading

Label Reading

FDA Food Allergen Labeling and Consumer Protection Act of 2004 (FALCPA)

Must list the allergen within the ingredient list using its common name

"milk" NOT "casein"

"egg" NOT "albumin"

Label Reading

Ingredients

Boneless Skinless Chicken Breast With Rib Meat, Water, Wheat Flour, Yellow Corn Flour.Contains 2% or Less of the Following: Flaxseed Meal, Sea Salt, Natural Flavor, Yeast, Extractive of Paprika (Color), Canola Oil, Distilled Vinegar, Malted Barley Flour, Corn Starch, Guar Gum, Isolated Soy Protein, Leavening (Sodium Bicarbonate).

INGREDIENTS: EDAMAME PODS (SOYBEANS).
CONTAINS: SOY

Why We Never Assume

Ingredients

← Free of top 9 allergens

Corn, Vegetable Oil (Corn, Canola, and/or Sunflower Oil), and Salt.

Contains MILK

Ingredients

Corn, Vegetable Oil (Corn, Canola, and/or Sunflower Oil), Maltodextrin (Made from Corn), Salt, Sugar, Natural Flavors, Dextrose, Sour Cream (Cultured Cream, Skim Milk), Whey, Spice, and Yeast Extract.

*images obtained from Kroger's website

Why We Never Assume (Part II)

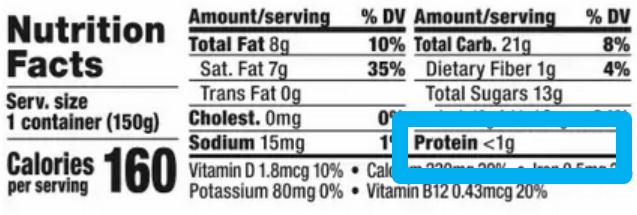
Photo credit: https://www.biggerbolderbaking.com/homemade-pasta-2-ingredient/

INGREDIENTS: WHOLE GRAIN DURUM WHEAT FLOUR.

Photo credit: https://www.amazon.com/Barilla-Pasta-Rotini-16-Ounce/dp/B000RLPJHQ/ref=sr_1_2_f3_0o_fs?crid=I023WFXL61IH&keywords=barilla+rotini+pasta&qid=1699652191&sprefix=barilla+rotini%2Caps%2C823&sr=8-2

Always check ingredient labels, products can change anytime.

Coconut milk
Yogurt alternative



Nutrition Facts

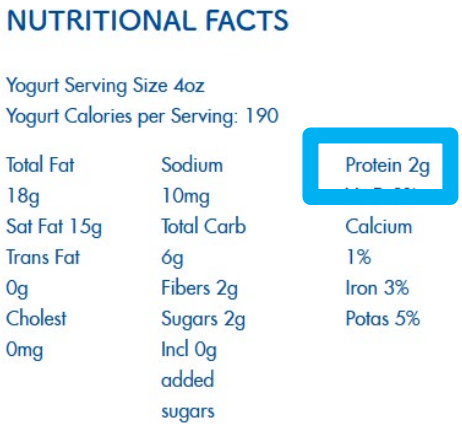
Serv. size
1 container (150g)

Calories per serving **160**

Amount/serving	% DV	Amount/serving	% DV
Total Fat 8g	10%	**Total Carb.** 21g	8%
Sat. Fat 7g	35%	Dietary Fiber 1g	4%
Trans Fat 0g		Total Sugars 13g	
Cholest. 0mg	0%		
Sodium 15mg	1%	**Protein** <1g	

Vitamin D 1.8mcg 10% • Cal…
Potassium 80mg 0% • Vitamin B12 0.43mcg 20%

Pure coconut
ORGANIC
Cultured Coconut

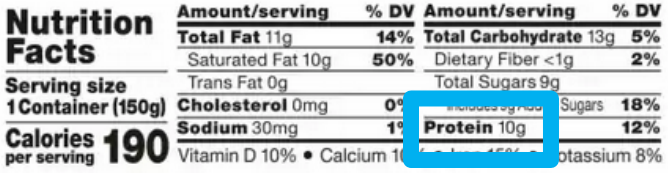


NUTRITIONAL FACTS

Yogurt Serving Size 4oz
Yogurt Calories per Serving: 190

Total Fat 18g	Sodium 10mg	Protein 2g	
Sat Fat 15g	Total Carb 6g		Calcium 1%
Trans Fat 0g	Fibers 2g		Iron 3%
Cholest 0mg	Sugars 2g		Potas 5%
	Incl 0g added sugars		

Greek
Coconutmilk
Thick and creamy



Nutrition Facts

Serving size
1 Container (150g)

Calories per serving **190**

Amount/serving	% DV	Amount/serving	% DV
Total Fat 11g	14%	**Total Carbohydrate** 13g	5%
Saturated Fat 10g	50%	Dietary Fiber <1g	2%
Trans Fat 0g		Total Sugars 9g	
Cholesterol 0mg	0%	Sugars	18%
Sodium 30mg	1%	**Protein** 10g	12%

Vitamin D 10% • Calcium 1…
…otassium 8%

Images obtained from Kroger's website and Cocojune's website

Accessibility of Safe Foods

75¢/ 3 oz

50¢/ 1 oz

50¢/ 2 tbsp

33¢/ 3 oz

62¢/ 2 oz

40¢/ 1/2 cup

21¢/ 1/2 cup

45¢/ 2 tbsp

25¢/ 1/2 cup

65 ¢/ 4 oz

49¢/ ¾ cup

17¢/ 2 tbsp

17¢/ 5 crackers

20¢/ ¾ cup

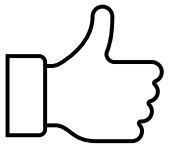
57¢/ 1/2 cup

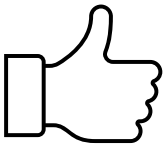
Ensuring Nutrition Adequacy

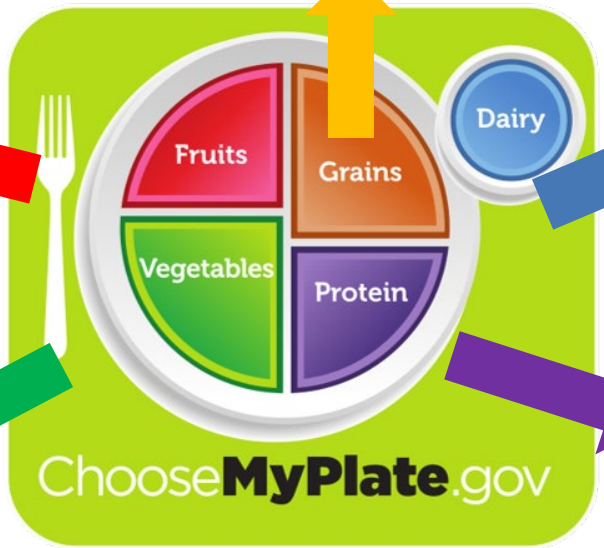
- Focusing on offering a variety of foods
- Considering a vitamin/mineral supplement
  - Do any need to be discontinued?
- Formula:
  - Supplemental
  - Sole Source
- Using data and trends:
  - Anthropometrics
  - Nutrition related lab values
  - Other: DEXA scans

Building a 6 Food Elimination Diet Plate

- Corn
- Rice
- Potato
- Millet
- Quinoa
- Buckwheat
- Amaranth Grain
- Teff
- Sorghum
- Cassava/tapioca







- Pea protein “milk”
- Oat “milk”
- Rice “milk”
- Hemp “milk”
- Milk + soy free butter substitutes

- Meat, poultry
- Peas
- Beans
- Quinoa
- Sunflower seeds
- Pumpkin seeds
- Chia seeds
- Flax seeds

CASE STUDIES

A

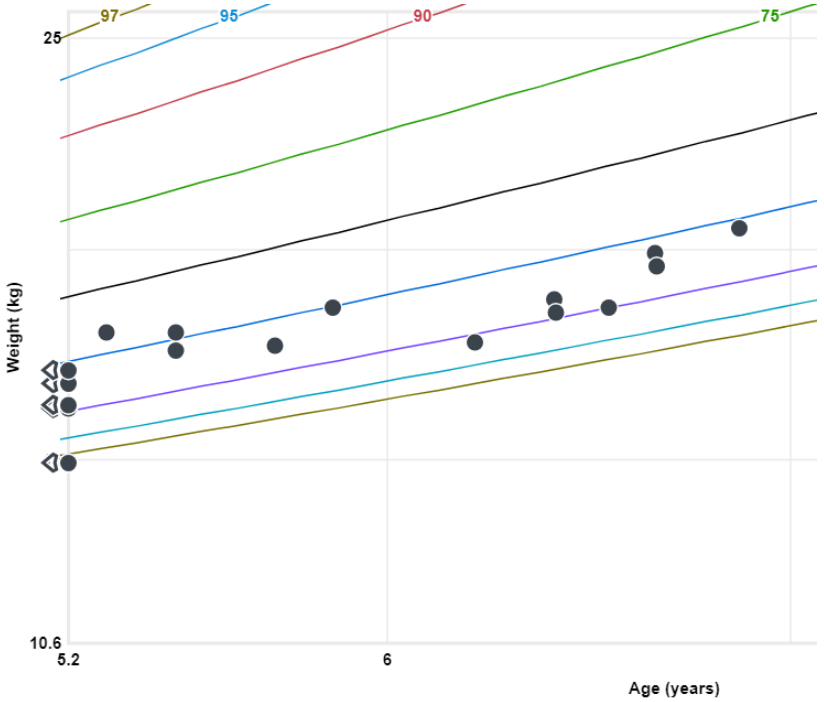
- 4 year old male
- Medical history:
  - EoE, asthma, feeding difficulties, poor growth
  - Concerns for IgE food allergies based on previous adverse reactions after ingestion: eggs, milk
- Nutrition:
  - Gtube:
    - Amino acid formula
    - Sole source nutrition
    - Elemental safe foods
    - Food trials

Summary of EoE treatment:

- Inactive disease on 100% elemental diet
- Active disease after several individual food trials:
  - apple
  - buckwheat
  - potatoes
  - corn
  - rice
  - pork

History of Poor Growth

- History of poor growth
- RD has worked closely with family to create feasible tube feed regimen



Recent f/u GI appointment

- Trial: Flovent (1 puff, BID) for 6 weeks, then add new food (buckwheat) for 3 months
  - Scope Results: 30 Eosinophils/hpf **(Active EoE)**

- Options for next steps:
  - Increase to 2 puffs flovent, BID
  - OR keep at current Flovent dose, remove buckwheat, add new food (cauliflower)
  - Consider Dupixent, remove buckwheat

- Decision:
  - Dupixent
  - No changes to diet for 4-6 months after starting Dupixent
  - Scope to evaluate inflammation to determine efficacy of Dupixent
    - Pt to continue Flovent

Results of f/u scope

- Inactive disease!
  - Treatment: Dupixent, Flovent

- Next steps:
  - Can discontinue Flovent
  - Trial of 1 low risk food
    - Family decided apple

Results of f/u scope

- Inactive!
  - Dupixent + apple trial
- Next steps:
  - Continue food trials
  - 1-3 new foods at a time is okay with physician

Options for future trials

- GI worked with Allergist
  - Okay with expansion of diet to other foods:
    - Low risk foods: fruits, vegetables
    - Wheat, soy, peanut, fish or shellfish
  - History of immediate adverse reactions:
    - Would NOT introduce milk, egg without doing an Oral Food Challenge in office
    - **Would reintroduce wheat first**
- Family decision:
  - Apple + bison
  - Still wants to be conservative with number of added foods due to fear of having active scope

B

- 5 year old male
- Dx with EoE, following 6FED
- Diet
  - Family over-restricting
  - Parental anxieties high in regards to expense of foods & access to these foods
  - Pt generally has challenges finished meals and snacks
- Formula: none

B

- Scope: active EoE
- Plan:
  - **Formal PPI trial on current diet**
  - **Plan for repeat EGD no sooner than 8 weeks**
  - **Results should help clarify the diagnosis, after which we can embark on therapy as appropriate**

B - Initial RD Assessment

Fluid intake: water (drinks throughout the day), Not Milk (8 oz)

Foods avoiding at this time: 6FED

IgE allergies: none

Vitamin/Mineral Supplements: MVI - Nature's Way Alive Kids chewable MVI

Typical 24 Hour Intake:

Breakfast	*Banana bread (homemade), homemade packes, sometimtes trix + flax milk*
Snack	*At school; packs - homemade baked good + veggie chips OR fruit*
Lunch	*At school; packs - 8 oz Not Milk* *Turkey Tacos + DF shredded cheese + rice + fruit* *OR meatload/meatballs (turkey) + variation of foods* *OR pastas* *OR chicken nuggets* *+ homemade treat*
Snack	*At home: variatin of foods*
Dinner	*Carb/vegetable/protein/fruit*

Nutrition Diagnosis + Intervention

- Nutrition Intervention:
  - AIM: liberalize diet within current restrictions
    - **Re-education of Empiric Six Food Elimination Diet (SFED) Education:**
      - **Focused on** label reading
      - Expanding appropriate substitutions of eliminated foods
    - **Provided several supporting education handouts** to supplement education and provide several food product/recipe examples to ease implementation at home
  - Calcium and vitamin d supplement

3 Month Follow-up

- Trial: 6FED **+ PPI**
- Growth goal: 5.5 g/day (18.3 kg April 23)
  - Weight on 6/21: 17.9 kg
  - ~2% weight loss
    - RD provided formula samples to allow family time to trial
      - Pea protein formula
      - Amino acid-based formula
    - RD set-up telehealth appointment for a few weeks post scope to allow for time scope results and to give family time to see which formula patient preferred

Scope Results

Active Esophagitis

After biopsy results came back family had the choice between:

1) Keeping current diet regimen **+ steroid**

2) **Removal of additional food(s)**

Green pea

RD Reassessment

- *Fluid intake*: drinks water throughout the day
  - + either 8 oz flax milk OR not milk
- *Foods avoiding at this time:* 6FED minus oat
- IgE allergies: none
- *Vitamin/Mineral Supplements*: kids alive (2 per day)

Typical 24 Hour Intake:

Breakfast	*Skips usually (1-2 times a week will have)* *Julie's Table Bread+ Earth Balance soy free butter + cinnamon sugar (2 pieces), jelly* *OR pancakes with formula OR cereal*
Lunch	*Chicken nuggest + bbq sauce + veggie chips + fruit* *OR leftovers from night before*
Snack	*Chips and hummus OR popcorn OR Enjoy Life cookies*
Dinner	*Taco meat OR meat loaf* *GF pasta (Barilla most common)*

Fruit

Smoothies: banana, flax milk, honey, cinnamon, couple scoops
*not everyday, 1 times per day

Ingredients

Flaxmilk (Filtered Water, Cold Pressed Flax Oil), Pea Protein, Contains 2% or Less of: Tricalcium Phosphate, Pea Starch, Sunflower Lecithin, Sea Salt, Natural Flavor, Gellan Gum, Xanthan Gum, Vitamin A Palmitate, Vitamin D2, Vitamin B12.

Ingredients:
Water, Sunflower Oil, Contains less than 2% of: Pea Protein, Sugar, Soluble Corn Fiber, Pineapple Juice Concentrate, Dipotassium Phosphate, Calcium Carbonate, Gellan Gum, Acacia Gum, Salt, Natural Flavor, Cabbage Juice Concentrate, Vitamin D2, Vitamin B12.

Nutrition Facts

15 servings per container

Serving size **1 slice (40g)**

Amount per serving

Calories **100**

	% Daily Value*
Total Fat 2.5g	**3%**
Saturated Fat 1g	**5%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 240mg	**10%**
Total Carbohydrate 19g	**7%**
Dietary Fiber 3g	**11%**
Total Sugars 1g	
Includes 0g Added Sugars	**0%**
Protein 1g	**2%**
Vitamin D 0mcg	0%
Calcium 30mg	2%
Iron 0mg	0%
Potassium 0mg	0%

* The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

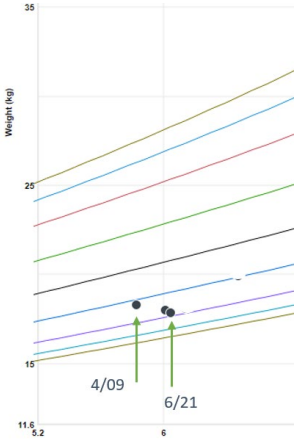
INGREDIENTS: water, white rice flour, tapioca syrup, potato starch, palm oil, modified tapioca starch, organic cane sugar, canola oil, sea salt, cultured dextrose, rice vinegar, yeast (yeast, sorbitan monostearate, ascorbic acid), modified cellulose, dehydrated rice syrup & grape juice, vegetable fibers (citrus, pea, potato, psyllium, norwegian kelp), xanthan gum, guar gum, invert syrup, enzymes

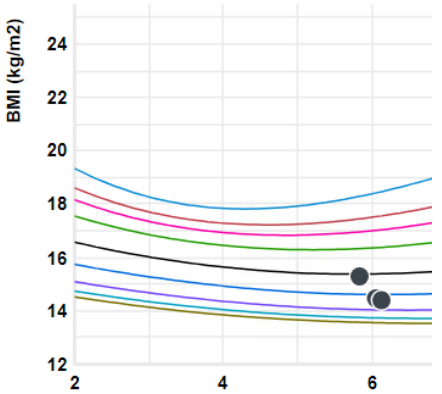
Ingredients

Vegetable Oil Blend (Canola, Safflower and Flax Oils), Palm Oil, Water, Contains 2% or Less of: Salt, Natural Flavor, Pea Protein, Sunflower Lecithin, Olive Oil, Lactic Acid, Annatto Extract (Color).

Growth Re-assessment

- Weight: 5.5-8 g/day for catch-up growth
  - April– 18.3 kg (21.2%, Z = -0.80 SD)
  - June – 17.9 kg (11.9%, Z = -1.18 SD)
- Height:
  - April - 109.5 cm (16.6%, Z = -0.97SD)
  - June: - 111.1 cm (18.4%, Z = -0.90SD)
- BMI:
  - April: 15.26 (16.6%, Z = -0.97SD)
  - June: 14.47 cm (20.8%, Z = -0.81 SD)





Nutrition Diagnosis & Intervention

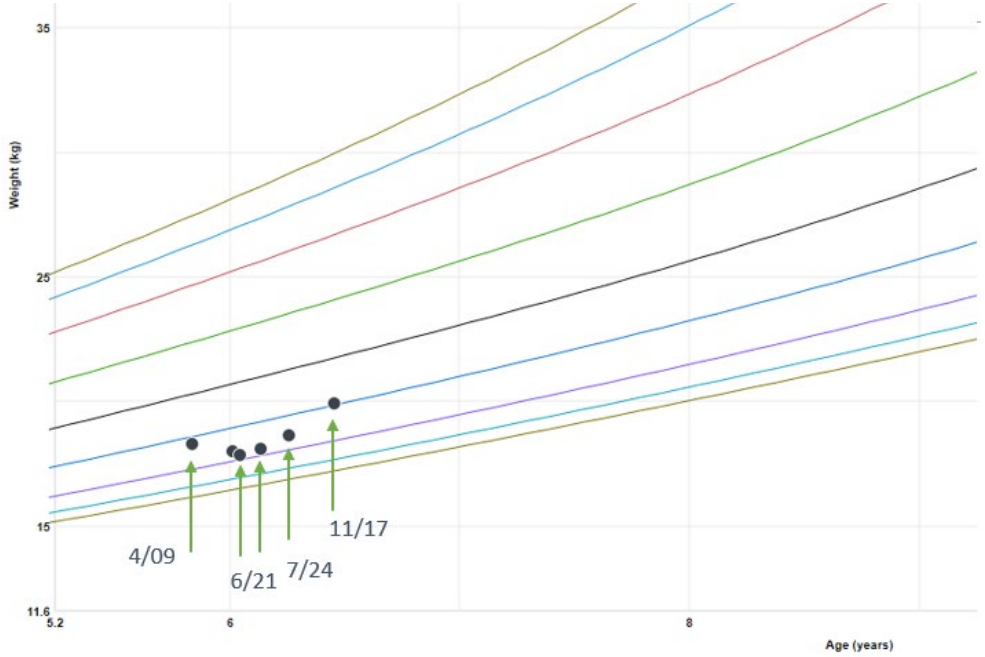
- Nutrition Diagnosis
  - Food and Nutrition knowledge deficit related to removal of green pea as evidenced by physician referral for education

- Nutrition Intervention
  - Formula Goal:
    - 15 scoops **amino acid based** in various foods & smoothies
  - Provided ingredient and product substitutions

Follow-up Scope

- Scope: 11/17 –
  - **Inactive disease!**
  - Physician recommendation to trial 1 food
  - Family decided to trial tree nuts

Follow-up Weight



- Pt getting 10-15 scoops/day amino-acid based formula
- RD recommended to continue
- Weight check in 2 months

Take Home Message

- There are a variety of approaches to treat EoE
- Shared decision making is essential to providing optimal patient care
- Diet therapy is an appropriate avenue to pursue
  - RD are qualified nutrition professionals that should be utilized to facilitate:
    - Qualify of life
    - Prevent/intervene in the presence of nutrient deficiencies and poor growth

References

1. Groetch M, Henry M, Feuling MB, Kim J. Guidance for the nutrition management of gastrointestinal allergy in pediatrics. J Allergy Clin Immunol Pract. 2013 Jul-Aug;1(4):323-31. doi: 10.1016/j.jaip.2013.05.002. Epub 2013 Jun 28. PMID: 24565537.
2. Collins SC. Practice Paper of the Academy of Nutrition and Dietetics: Role of the Registered Dietitian Nutritionist in the Diagnosis and Management of Food Allergies. J Acad Nutr Diet. 2016 Oct;116(10):1621-1631. doi: 10.1016/j.jand.2016.07.018. PMID: 27671759.
3. Mehta H, Groetch M, Wang J. Growth and nutritional concerns in children with food allergy. Curr Opin Allergy Clin Immunol. 2013 Jun;13(3):275-9. doi: 10.1097/ACI.0b013e328360949d. PMID: 23510952; PMCID: PMC4280668.
4. Meyer R. Nutritional disorders resulting from food allergy in children. Pediatr Allergy Immunol. 2018 Nov;29(7):689-704. doi: 10.1111/pai.12960. PMID: 30044008.
5. Merritt RJ, Fleet SE, Fifi A, Jump C, Schwartz S, Sentongo T, Duro D, Rudolph J, Turner J; NASPGHAN Committee on Nutrition. North American Society for Pediatric Gastroenterology, Hepatology, and Nutrition Position Paper: Plant-based Milks. J Pediatr Gastroenterol Nutr. 2020 Aug;71(2):276-281. doi: 10.1097/MPG.0000000000002799. PMID: 32732790.
6. Venter C, Mazzocchi A, Maslin K, Agostoni C. Impact of elimination diets on nutrition and growth in children with multiple food allergies. Curr Opin Allergy Clin Immunol. 2017 Jun;17(3):220-226. doi: 10.1097/ACI.0000000000000358. PMID: 28323676.
7. Groetch M, Venter C, Skypala I, et al. Dietary Therapy and Nutrition Management of Eosinophilic Esophagitis: A Work Group Report of the American Academy of Allergy, Asthma, and Immunology. *J Allergy Clin Immunol Pract*. 2017;5(2):312-324.e29. doi:10.1016/j.jaip.2016.12.026

Thank you for joining today's presentation.

Please feel free to ask any questions at this time!

Access Survey to Receive Certificate

https://www.surveymonkey.com/r/EOE24

1. Scan QR Code
2. Complete Survey
3. CE Certificate will appear after you click Submit