THE FODMAP DIET

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Disclosure

• The content of this program has met the continuing education criteria of being evidence-based, fair and balanced, and non-promotional.

• This educational event is supported by Abbott Nutrition Health Institute, Abbott Nutrition.

• I am currently an employee of Abbott Nutrition.
Learning Objectives

• List the 6 FODMAP groups and name one food source for each
• Name the condition that the low FODMAP diet is used for and describe how it is purported to reduce symptoms
• Describe how to initiate and manage a patient on a low FODMAP diet and list 2 potential concerns
Overview

- Provide the definition of FODMAPs and examples of each
- Define functional bowel disorders, specifically irritable bowel syndrome (IBS)
- Discuss the relationship between IBS and FODMAPs
- Review the current research on low FODMAP diets for IBS
- How to start and manage a patient on a low FODMAPs diet
- Describe the potential concerns with a low FODMAPs diet
Definition

• FODMAPs:
  • Fermentable Oligo-, Di-, Monosaccharide and Polyols
• Short-chain carbohydrates and sugar alcohols
• Fructose, lactose, fructans, mannitol, sorbitol, galactans
• Used to ease symptoms of functional bowel disorders

Functional Bowel Disorders

- Bowel looks normal but has disordered actions
- Irritable bowel syndrome (IBS), chronic diarrhea or constipation or bloating
- Cause(s) unknown

Irritable Bowel Syndrome (IBS)

- Condition of hypersensitivity leading to an abnormal reaction in the gut
- Characterized by abdominal pain, gas, bloating, diarrhea, constipation
- Different subtypes
  - Diarrhea-predominate
  - Constipation-predominate
  - Mixed

Rome III Criteria

| ROME III | 
|-----------------|-----------------|
| Symptoms for at least 6 months | 
| Positive diagnosis must include the following: | 
| 1. Abdominal pain/discomfort at least 3 days/mo for last 3 months, and 2 of the following true >25% of the time: | 
| - Improvement with defecation | 
| - Onset associated with change in stool frequency | 
| - Onset associated with change in stool appearance | 
| 2. Symptoms not caused by an inflammatory, metabolic, anatomical, or neoplastic condition | 

IBS

- Food can trigger symptoms
- No effect on underlying condition
- FODMAPs are potential triggers due to their effects within the gut
- Potential to mitigate symptoms though avoiding offending foods

FODMAPs and IBS

- FODMAP carbohydrates are minimally absorbed in the small intestine
  - High osmolality
  - Fermentable
- Normal process that is generally not problematic in healthy individuals
- In an abnormally hypersensitive gut, can lead to symptoms
Osmotic effect of FODMAPs
Osmotic effect of FODMAPs
Osmotic effect of FODMAPs

PERITONEAL SPACE

GUT

PERITONEAL SPACE
Bacterial effect of FODMAPs

PERITONEAL SPACE

GUT

PERITONEAL SPACE
Osmotic effect of FODMAPs
Other potential effects on the gut

- ↑ Gut motility
- Possible activation of hormonal/neural feedback pathways during osmotic pressure changes and short chain fatty acid production
- Abnormal GI endocrine cells in IBS
- Release hormones having endocrine effects leading to increased GI motility and sensation


FODMAPs and Gut Bacteria

- Gut bacteria generally fall into 3 categories:
  - Helpful
  - Harmful
  - Neither

- Both absolute number and species type affect health
- Many FODMAPs are prebiotics
- Encourage the growth of helpful bacteria

FODMAPs and Gut Bacteria

• Condition of small intestinal bacterial overgrowth (SIBO)
• Occurs in some with IBS
• May lead to:
  • ↑ Gut permeability
  • Fermentation and gas production within the small intestine
    • May delay transit time leading to constipation

FODMAPs and Gut Bacteria

- In the large intestine multitude of FODMAP-digesting bacteria species
- Gas production may be hydrogen or methane
- Not all fermentation is gas producing

Where’s the FOOD?
Foods - Examples

**Excess Fructose**
- Apple, watermelon, pear, asparagus, sugar snap peas, high fructose corn syrup, honey, agave

**Lactose**
- Milk (cow, sheep, goat), evaporated, sweetened condensed, dry powder, custards, dairy desserts

**Fructans**
- Wheat, onion, leeks, FOS

<table>
<thead>
<tr>
<th>Foods - Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mannitol</strong></td>
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<tr>
<td>• Watermelon, cauliflower, mushrooms, snow peas, sweetener</td>
</tr>
<tr>
<td><strong>Sorbitol</strong></td>
</tr>
<tr>
<td>• Apples, apricots, nectarines, peaches, pears, plums, sweetener</td>
</tr>
<tr>
<td><strong>Galactans</strong></td>
</tr>
<tr>
<td>• Chickpeas, legumes, lentils</td>
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</tbody>
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Why **Excess** Fructose is a problem


Why **Excess** Fructose is a problem


Why **Excess** Fructose is a problem


FODMAP Research

- Objective: to investigate the effects of a low FODMAP diet vs typical Australian diet in IBS and healthy individuals

- Study Design:
  - Randomized, controlled, single-blind, crossover
  - n=38, 30 ROME III IBS, 8 healthy
  - 21 d of study/control diet → 21 d washout → 21 d control/study diet
  - Subjective/objective assessments
  - Total FODMAP content in the study diet = <0.5 g per sitting (meal/snack)

Results

• IBS subjects (~70%)
  - ↓GI symptom scores
  - ↓Bloating, pain, gas
  - ↑Satisfaction with stool consistency
  - Only diarrhea predominate IBS subjects had significant changes to stool

• Healthy subjects
  - No significant changes between diets

FODMAP Research

- Objective: evaluate the effects on colonic health after a low FODMAP diet vs typical Australian diet
- Study Design:
  - RCT
  - n=33, 27 ROME III IBS, 6 healthy
  - 21 d of study/control diet → 21 d washout → 21 d control/study diet
  - Total FODMAP content in the study diet = average 3 g/day
  - Measured stool pH, SCFA concentration, bacterial number and species diversity

Halmos EP, Christophersen CT, Bird AR, Shepherd SJ, Gibson PR, Muir JG. Diets that differ in their FODMAP content alter the colonic luminal microenvironment. Gut. 2015 Jan;64(1):93-100.
Results

- Low FODMAP diet
  - ↑pH (7.37 vs 7.16)
  - ↓Bacterial number
  - No difference in SCFA concentrations
- Typical Australian and habitual diets (washout)
  - ↑numbers of several species of health promoting bacteria

Halmos EP, Christophersen CT, Bird AR, Shepherd SJ, Gibson PR, Muir JG. Diets that differ in their FODMAP content alter the colonic luminal microenvironment. Gut. 2015 Jan;64(1):93-100.
FODMAP Review

- Objective: summarize evidence of a low FODMAP diet to manage food intolerance in IBS
- Study design:
  - 40 articles, 31 studies, 9 reviews
  - Evaluated evidence on FODMAP possible mechanisms, benefits, limitations, concerns, and dietary management

Results

• Evidence points to the role of food triggering IBS symptoms

• Dietary changes potentially can decrease symptoms and increase QOL

• Further study needed on:
  • Nutrition concerns related to restrictive nature
  • Specific populations where effect is greatest
  • Identifying non-IgE-mediated food allergy biomarkers
  • Evaluation of other foods that effect visceral hypersensitivity, immunity

FODMAP Research

- Objective: to study the efficacy of a low FODMAP diet in children and determine if microbial composition are associated with diet efficacy

- Study Design:
  - Randomized, double blind, crossover
  - 33 children ROME III IBS
  - 7 day habitual diet → 48 h FODMAP/typical American childhood diet (TACD) → 5 day habitual diet → 48 h TACD/FODMAP diet
  - Intervention diet food was provided (9 g/d vs. 50 g/d FODMAP content)
  - Stool were collected and analyzed for microbial composition prior to interventional diets

Results

• Pain
  • Less abdominal pain during low FODMAPs vs habitual
  • More pain episodes during TACD vs. habitual
• Stool microbial composition
  • Responders had significantly different microbial biomes compared to Nonresponders
  • Taxa found in Responders known for high saccharolytic metabolic capacity
  • Potential for use as a biomarker to predict diet efficacy

Implementation of low FODMAPs Diet

1. Comprehensive diet assessment
2. Explain scientific basis
3. Give low FODMAPs diet specifics
4. Teach ways to maintain compliance away from home
5. Start Diet!
Low FODMAPs Diet

1. Diet Assessment:
   - To get an accurate view of what patient is eating/patterns of consumption
   - Goal is find out which FODMAPs the patient consumes on a daily basis
   - Use to better direct the patients dietary choices to make the most effective use of the restrictions

Low FODMAPs Diet

• Limitations to Diet Assessment
  • Limited availability of published data on FODMAP content of various foods
  • No strong consensus on FODMAP content threshold
    • What level is low?
  • Low FODMAP content in excess
    • How many low FODMAP foods does it take to make a high FODMAP diet?

Low FODMAPs Diet

2. Explain scientific basics to patients:
   - Better understanding can lead to better diet compliance
   - Aim for providing an understanding of:
     - The malabsorption that occurs
     - How subsequent fermentation leads to symptoms

Low FODMAPs Diet

3. Give patients the specifics on the diet
   - High and low FODMAP content foods
   - How long they should be on the diet
   - Recording foods and symptoms
   - Awareness that some chewing gums and beverages contain FODMAPs too

   - The good news – global restriction shouldn’t be long term

Low FODMAPs Diet

4. Teach patients strategies to deal when patient is not in control of their food prep
   - Carry low FODMAP snacks
   - Pack lunch
   - Find an option or two on restaurant menu before going in
4. Planning is the key

# Low FODMAP Food Examples

**Grains:**
- quinoa, rice, corn, oats

**Fruits:**
- banana, grapes, pineapple, strawberry, prickly pear

**Vegetables:**
- broccoli, potato, lettuce, tomato, zucchini

**Dairy:**
- ripened cheeses, butter, cream, lactose free dairy

**Sweeteners:**
- table sugar (sucrose), stevia, aspartame, glucose

**Other:**
- tofu, seeds, flax, herbs, nonstarch polysaccharides

Low FODMAPs Diet Example

**Breakfast:**
- Oatmeal, banana

**Lunch:**
- Lettuce salad with tomato, grilled chicken, quinoa, and a herbed vinegar/oil dressing

**Dinner:**
- Baked fish (or beef, pork, or tofu) with rice, mashed potatoes, steamed broccoli

**Snacks:**
- Grapes, strawberries, sunflower seeds, rice cakes
Low FODMAPs Diet

- Continue until achieve symptom relief (no more than 6-8 weeks)
- Begin reintroduction to avoid unnecessary restriction
- If inadequate response:
  - Determine compliance
  - If compliance established:
    - Reduce resistant starch, soluble/insoluble fiber
    - Consider gluten, food chemicals, caffeine, fat, meal size and regularly

## Rechallenge Foods

<table>
<thead>
<tr>
<th>Fodmap</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fructose</td>
<td>2 tsp honey</td>
</tr>
<tr>
<td>Lactose</td>
<td>240 mL milk</td>
</tr>
<tr>
<td>Fructans</td>
<td>2 slices wheat bread</td>
</tr>
<tr>
<td>Galactans</td>
<td>½ cup lentils/legumes</td>
</tr>
<tr>
<td>Sorbitol</td>
<td>4 dried apricots</td>
</tr>
<tr>
<td>Mannitol</td>
<td>½ cup mushrooms</td>
</tr>
</tbody>
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Enteral Feeding-Associated Diarrhea

- Could it be related to FODMAP content?
- Review: majority of cases not related to the formula
  - *C. diff* and other intestinal infections
  - Antibiotics
  - Hyperosmolar medications
- Inulin in large doses can cause excess gas
- FOS can enhance resistance to *C. diff*, large doses can cause bloating
- Prebiotic fiber dose and mixture can improve tolerance


Potential Issues

• Quite restrictive, especially carbs and fiber
• Can be expensive
• No long term safety data
• Long term use not recommended
• Not recommended in healthy people or those without bowel problems
FODMAPs Summary

• Seem to show a modest decrease in IBS symptoms in about 70% of patients
• Decreases in healthful gut bacteria are seen when FODMAPs are restricted
• Some FODMAPs are prebiotics and have a beneficial effects on gut health
• Long term use of a low FODMAPs diet has not been studied at this time and is not recommended
Thank you!

- Questions?