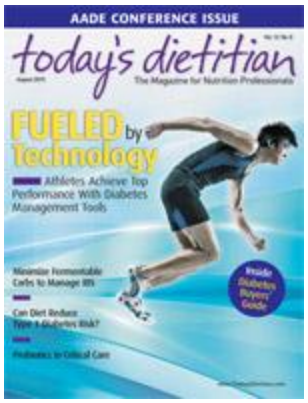
August 2010 Issue



The FODMAPs Approach — Minimize Consumption of Fermentable Carbs to Manage Functional Gut Disorder Symptoms
By Kate Scarlata, RD, LDN
Today's Dietitian
Vol. 12 No. 8 P. 30

Reducing intake of foods such as apples, pears, and peaches may spell relief for individuals with irritable bowel syndrome and other conditions.

Irritable bowel syndrome (IBS), functional diarrhea, and functional abdominal bloating are classified as functional gut disorders (FGDs). These conditions occur as a result of alterations in the function of the intestine and/or nervous system rather than the presence of physical abnormalities in the gut. FGDs are widespread conditions; in fact, IBS impacts about 20% of American adults.1 Although research has linked diet and symptom induction, studies have lacked evidence to support the widespread use of diet alterations for therapeutic benefit in this population.

Functional gut symptoms vary from person to person, so managing them with a one-size-fits-all approach is rare. Among treatments such as modifying meal size; alcohol, fat, and fiber consumption; and lifestyle, medication use, and supplement use, the FODMAPs approach is a dietary intervention gaining attention for its potential efficacy in managing FGD symptoms. FODMAPs is an acronym for Fermentable, Oligo-, Di- and Mono-saccharides and Polyols, used to describe a group of fermentable short-chain carbohydrates. Some evidence suggests that reducing global intake of FODMAPs to manage functional gut symptoms provides symptom relief for about 75% of patients with FGDs.2

William Chey, MD, co–editor-in-chief of the American Journal of Gastroenterology and professor of internal medicine at the University of Michigan Health System, notes, ”It is becoming increasingly clear that the normal development and function of the GI [gastrointestinal] tract is greatly influenced by the bacterial flora that reside within the gut and the food one ingests. In fact, these two factors are linked, as the food we eat likely influences the flora that lives in our GI tract. GI symptoms like cramping, diarrhea, and particularly gas and bloating can occur as a consequence of fermentation of food by the gut bacteria. FODMAPs represent the food types that are most prone to fermentation by the gut bacteria. Taking FODMAPs out of the diet often significantly improves GI symptoms.”

It’s no surprise that living with IBS can greatly impact an individual’s quality of life. Work productivity and physical well-being decline when symptoms appear. Abdominal bloating, present in 82% of those with IBS, is one of the top reasons people seek medical care and utilize antigas medications, often to no avail.3 Professionals should

consider a trial of the FODMAPs approach in this population to help manage symptoms. Clients who do not experience improved symptom management should continue to work in close collaboration with a dietitian and a gastroenterologist to rule out other potential dietary triggers or health issues.

The Approach

FODMAPs are prevalent in the diet and are composed of oligosaccharides (fructans, galactans), disaccharides (lactose), monosaccharides (fructose), and polyols (sugar alcohols). Experts have known for some time that lactose can contribute to gas, bloating, and diarrhea in those with hypolactasia. With the advent of sugar-free products, they found that the overuse of sugar alcohols can lead to diarrhea. More recently, they established that fructose can be malabsorbed and mimic symptoms of lactose intolerance.

The FODMAPs approach addresses the total amount of fermentable sugars consumed rather than looking at each sugar individually. This dietary intervention takes into account that there is a threshold for the amount of global FODMAPs an individual can tolerate at one time. Reiterating this key point, a leading researcher of the FODMAPs approach, Peter R. Gibson, MD, FRACP, a professor of medicine and gastroenterologist at Monash University at Box Hill Hospital in Victoria, Australia, observes, “Fructans (fructo-oligosaccharides [FOS]), sorbitol, and galactans (galacto-oligosaccharides), as well as lactose in those with lactose malabsorption, have additive effects with fructose.”

Collectively, FODMAPs, as short-chain sugars, can be easily fermented and exert an osmotic effect, increasing fluid delivery into the large bowel and resulting in gas, pain, and osmotic diarrhea. Those with visceral hypersensitivity or gut motility disorders appear to be more distressed by these side effects. The colonic microflora feast on the malabsorbed sugars and create gas, which contributes to abdominal bloating. Growing evidence reveals the beneficial role of minimizing FODMAPs for those with FGDs such as IBS.2,4

Meet the Family

Lactose

Lactose is the sugar found in mammalian milk such as cow’s, sheep’s, and goat’s milk. Lactose intolerance is caused by reduced or absent lactase enzyme production. Without the lactase enzyme, lactose cannot be hydrolyzed into its digestible components, glucose and galactose. Ruling out lactose intolerance with a hydrogen breath test is a desirable goal because if no intolerance is present, there is no need to modify lactose intake. Lactose intolerance presents at various thresholds from person to person. Lactose malabsorption contributes to abdominal bloating, pain, gas, and diarrhea, often occurring 30 minutes to two hours following the consumption of milk and milk products.5

As FODMAPs have a collective impact on GI symptoms, limiting lactose consumption (if a patient defers hydrogen breath testing or testing is not available or if a patient has

documented lactose intolerance) with other fermentable short-chain carbohydrates is a good starting point with the FODMAPs approach. Encourage clients to choose low-lactose cheeses, including Swiss, Parmesan, Gouda, Colby, provolone, cheddar, Edam, Muenster, and Monterey Jack. Lactose-free milk and lactose-free cottage cheese are great sources of protein and calcium. Rice milk is another lactose-free alternative, but it contains less protein. Yogurt with live and active cultures may be easier on the intestines but, as a lactose source, should be eliminated initially and reintroduced when symptoms are better controlled to assess tolerance.

Individuals should avoid lactose-rich foods such as ice cream, milk, condensed milk, and most soft cheeses (eg, cottage cheese), as they are not FODMAP friendly for those with lactose intolerance.

Fructose

Fructose, most commonly known as fruit sugar, is also found in honey, high-fructose corn syrup (HFCS), agave, sucrose (table sugar) bound to glucose, and fructans. Fructose-containing foods with a 1:1 ratio of fructose to glucose are generally well tolerated on the FODMAPs diet. Conversely, foods with excess fructose compared with glucose, such as apples, pears, and mangoes, will likely trigger abdominal symptoms. Increased use of agave as an alternative to sugar may also contribute to FGD symptoms.

Jane Muir, PhD, head of research in the department of medicine at Monash University and one of the prominent researchers in this area, notes, "Agave is high in excess fructose, and therefore we would not recommend it for people with IBS."

Fruits that contain excess fructose combined with naturally occurring polyols, such as apples and pears, will likely contribute to more severe symptoms, as the excess fructose and polyols content contributes to the total FODMAP load.

Fructose malabsorption is defined as the incomplete absorption of fructose in the small intestine, followed by the delivery of fructose to the distal small bowel and colon, where it contributes to rapid fermentation and resultant abdominal bloating. The absorptive capacity of fructose varies from person to person. Like lactose intolerance, a hydrogen breath test can detect fructose malabsorption. Fructose is absorbed via a low-capacity, carrier-mediated facilitated diffusion GLUT5.6,7 A dietary load of 50 g of fructose produces fructose malabsorption in 80% of healthy subjects.7 Differentiating fructose malabsorption from hereditary fructose intolerance is essential, as fructose intolerance requires total avoidance of fructose.

Even when fructose is in the presence of glucose, individuals likely have a threshold for total fructose intake. Limiting the dietary load of fructose is another potential (yet not fully evaluated) component of the FODMAPs approach. Based on clinical observations, avoiding foods and beverages that contain greater than 0.5 g of fructose in excess of glucose per 100 g and/or greater than 3 g of fructose per serving regardless of glucose (considered a fructose load) is desirable to minimize symptoms.2 To be prudent,

patients should limit consumption to one serving of FODMAP-friendly fruit per meal. They should also consume ripe fruits, as ripeness affects the amount of fructose. Firm, less-ripe fruit tends to contain more fructose.8

Because HFCS is present in so many foods in the United States, fructose intake is likely at an all-time high. HFCS can be created with various amounts of fructose and glucose but most often contains 55% fructose and 45% glucose distribution. In many cases, individuals can tolerate small amounts of HFCS, as the amount of excess fructose is not great. Encouraging clients to eliminate or limit products made with HFCS, such as soda, barbeque sauce, and cereals, would be a conservative approach to minimizing their fructose load.

Fructans

Fructans are oligosaccharides made of fructose molecule chains that are completely malabsorbed because the small intestine lacks hydrolases to break their fructose-fructose bond. For this reason, fructans can contribute to bloating, gas, and pain. Wheat accounts for the majority of people's fructan intake.9 Fructan consumption of greater than 0.2 g per serving is considered a potential trigger amount.2

Inulin and FOS sources of fructans, are added to many foods to enhance their fiber content. Patsy Catsos, MS, RD, author of IBS-Free at Last, notes, "Inulin and FOS are added to foods and supplements precisely because they are fermentable fibers, meant to encourage the growth of friendly gut bacteria. While this makes sense in general, these food additives are sometimes poorly tolerated by people with IBS."

Galactans

Galactans are oligosaccharides containing chains of the sugar galactose. The human body lacks the enzymes to hydrolyze them into digestible components, so they are completely malabsorbed. Consequently, galactans can contribute to gas and GI distress. Dietary sources of galactans include lentils, chickpeas, kidney beans, black-eyed peas, broccoli, and soy-based products.

Polyols

Polyols are also known as sugar alcohols. Most are too large for simple diffusion from the small intestine, creating a laxative effect on the GI tract. They are found naturally in some fruits and vegetables and added as sweeteners to sugar-free gums, mints, cough drops, and medications. Polyols produce osmotic diarrhea when consumed in quantities above an individual's personal threshold or in combination with other FODMAP sources. Sugar alcohols have varying effects on the bowel. A polyol's molecular size affects absorption. Erythritol, a four-carbon polyol, is well absorbed, while many six-carbon polyols are not. Available data suggest that the GI disturbances are greater with mannitol compared with sorbitol and even less significant with xylitol.10

Catsos observes, "Patients frequently experiencing dry mouth as a side effect of medications may chew sugar-free gum or use FODMAPs-sweetened cough drops around the clock to combat dry mouth, only to end up with diarrhea instead."

Become a FODMAPs Detective
For a quick reference of FODMAP-friendly foods vs. “caution” foods rich in FODMAPs, refer to the “FODMAPs Checklist” table, a good starting point for this dietary approach. Research and the compilation of comprehensive food composition data are ongoing in the area of FODMAPs, and modifications and updates will likely be forthcoming.

Helping clients pay close attention to food ingredients can minimize their FODMAPs exposure. Some fiber supplements contain both sorbitol and inulin, making them a “no-go” on this diet. Others contain methylcellulose, a 100%-soluble, nonfermentable fiber, and therefore are FODMAP friendly.

Many cough drops contain sugar alcohols or honey, so you should direct clients to lozenges that do not contain these ingredients. Vitamin water containing crystalline fructose is not FODMAP friendly, while many beverages sweetened with aspartame are well tolerated.

Final Thoughts
Despite its apparent complexity, the FODMAPs approach can be effective when delivered by a dietitian skilled in its intricacies. Patient compliance with this diet is very good, likely due to quality-of-life improvements.2

Chey explains, “It has become clear to me that patients who are severely affected by food-related GI symptoms are already on a highly restricted diet by the time they come to see me. With proper instruction, most of these patients are able to institute the FODMAP [approach] and actually take comfort in having a specific list of foods that they should and should not eat."

As dietitians, we know that nutritional variety is paramount to a healthful diet. When educating clients, attempt to create a nutritional plan that does not completely eliminate FODMAPs but rather minimizes only those that are problematic. Gibson notes, “The foods that most commonly cause problems are onions (lots of fructans), pasta and bread made with wheat, apples, and pears.” A good food diary and symptom chart will be a helpful tool for you and your client in determining which foods create more GI distress.

— Kate Scarlata, RD, LDN, is a private practice nutritionist in Boston.

References
1. National Digestive Diseases Information Clearinghouse. Irritable bowel syndrome. NIH Publication No. 07-693. September 2007. Available at: http://digestive.niddk.nih.gov/ddiseases/pubs/ibs

2. Gibson PR, Shepherd SJ. Evidence-based dietary management of functional gastrointestinal symptoms: The FODMAP approach. ***J Gastroenterol Hepatol***. 2010;25(2):252-258.

3. Ringel Y, Williams RE, Kalilani L, Cook SF. Prevalence, characteristics, and impact of bloating symptoms in patients with irritable bowel syndrome. ***Clin Gastroenterol Hepatol***. 2009;7(1) 68-72.

4. Shepherd SJ, Parker FC, Muir JG, Gibson PR. Dietary triggers of abdominal symptoms in patients with irritable bowel syndrome: Randomized placebo-controlled evidence. ***Clin Gastroenterol Hepatol***. 2008;6(7):765-771.

5. National Digestive Diseases Information Clearinghouse. Lactose intolerance. NIH Publication No. 09-2751. June 2009. Available at: http://digestive.niddk.nih.gov/ddiseases/pubs/lactoseintolerance

6. Rumessen JJ, Gudmand-Høyer E. Absorption capacity of fructose in healthy adults. Comparison with sucrose and its constituent monosaccharides. ***Gut***. 1986;27(6):1161-1168.

7. Jiang L, David ES, Espina N, Ferraris RP. GLUT-5 expression in neonatal rats: Crypt-villus location and age-dependent regulation. ***Am J Physiol Gastrointest Liver Physiol***. 2001;281(3):G666-G674.

8. Muir JG, Rose R, Rosella O, et al. Measurement of short-chain carbohydrates in common Australian vegetables and fruits by high-performance liquid chromatography (HPLC). ***J Agric Food Chem***. 2009;57(2):554-565.

9. Moshfegh AJ, Friday JE, Goldman JP, Ahuja JK. Presence of inulin and oligofructose in the diets of Americans. ***J Nutr***. 1999;129(7 Suppl):1407S-1411S.

10. Mäkinen KK. Effect of long-term, peroral administration of sugar alcohols on man. ***Swed Dent J***. 1984;8(3):113-124.

Lactose Content of Various Foods and Beverages

Food	Serving Size	Lactose (g)
Milk	1 cup	11
Ice cream	½ cup	5
Cottage cheese	½ cup	2 to 3
Yogurt	1 cup	5 or higher
Swiss cheese	1 oz	Trace to 1
Cheddar cheese	1 oz	Trace to 1
Butter	1 tsp	Trace

Note: Author adapted table from multiple online sources

FODMAPs Checklist

FODMAPs	Lactose	Fructose	Fructans	Galactans	Polyols
Caution: Rich in FODMAPs	Milk, evaporated milk, yogurt, ice cream, custard, and certain cheeses such as ricotta, cottage, and mascarpone	Fruits such as apples, pears, peaches, mangoes, and watermelon; coconut milk; coconut cream; dried fruits; and fruit juices Sweeteners such as agave and honey HFCS-based products such as BBQ sauce, ketchup, and pancake syrup Alcohol such as sherry and port wine Sodas with HFCS	Vegetables such as artichokes, asparagus, Brussels sprouts, broccoli, beetroot, cabbage, chicory, garlic, leeks, okra, onions, radicchio lettuce, shallots, and snow peas Grains such as wheat and rye Added fiber such as inulin and fructo-oligosaccharides; watch items such as probiotic supplements, granola bars, and frozen desserts Fruits such as watermelon	Chickpeas, lentils, kidney beans, and soy products Vegetables such as broccoli	Fruits such as apples, apricots, blackberries, cherries, nectarines, pears, peaches, plums, prunes, and watermelon Vegetables such as cauliflower, button mushrooms, and snow peas Sweeteners such as sorbitol, mannitol, xylitol, maltitol, and isomalt (sugar-free gums/mints, cough medicines/drops)
FODMAP Friendly	Lactose-free milk, cottage cheese, ice cream, and sorbet; certain cheeses such as cheddar, Swiss, Parmesan,	Fruits such as ripe bananas, blueberries, grapefruit, grapes, honeydew, lemons, limes, passion fruit, raspberries,	Vegetables such as bok choy, bean sprouts, bell peppers, butter lettuce, carrots, celery, chives, corn, eggplant, green beans, tomatoes, potatoes, and		Fruits such as bananas, blueberries, grapefruit, grapes, honeydew, kiwi, lemons, limes, oranges, passion fruit, and raspberries

	and mozzarella	strawberries, and tangelos Sweeteners such as sugar and maple syrup	spinach Garlic-infused oil Gluten-free* breads/cereals, rice and corn pasta, rice cakes, and potato and tortilla chips		Sweeteners such as sugar, glucose, and aspartame

** Examine ingredients on gluten-free breads and cereals to ensure other FODMAPs such as honey and agave are not present.*

Note: Author adapted table from references 2 and 6