Dietary Triggers for IBS Symptoms: The Low FODMAP Diet Approach

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Introduction

Irritable Bowel Syndrome (IBS) affects up to one in five Americans. It is a condition that is characterized by gut symptoms including abdominal pain, intestinal gas/wind, bloating, and changed bowel habit (ranging from diarrhea to constipation). Symptoms can often be debilitating and lead to a reduced quality of life.

A wide range of therapies have been used to control IBS symptoms including various medications, bulking agents and laxatives, and a myriad of lifestyle changes. Most individuals with IBS believe that their symptoms are related to the consumption of certain foods, but advice in this area has been conflicting and confusing and offered little relief for IBS sufferers. Our research team has developed a new dietary management approach – the Low FODMAP diet – to control symptoms associated with IBS. In Australia, the low FODMAP diet is increasingly being accepted as the primary management strategy for IBS, recently adopted by their National Therapeutic Guidelines.

Understanding the FODMAP Concept

Carbohydrates can be present in different forms in foods, varying from long-chain carbohydrates (e.g. starch) to simple sugars (e.g. glucose) that are well-digested and absorbed to produce energy. Fiber and resistant starch are long-chain carbohydrates resistant to digestion and are important for stool formation and normal bowel function.

Our research group has produced strong evidence that a group of short-chain carbohydrates, named FODMAPs (Fermentable Oligo-saccharides, Mono-saccharides And Polyols) are problematic for those with IBS. These short-chain carbohydrates are poorly absorbed in the small intestine and rapidly fermented by bacteria in the gut. The production of gas by these bacteria is a major contributor to symptoms. A pilot study first observed that three out of four patients with IBS responded symptomatically to restriction of FODMAP intake. Subsequently, several high-quality clinical studies have further confirmed that improvement is due to the reduction in FODMAP intake

Measuring FODMAPs in Foods

Our research team has developed the laboratory techniques required to quantify the different types of FODMAPs that are found naturally in foods. We are using these techniques to compile FODMAP composition tables. FODMAPs are found in a wide range of foods, Table 2 provides an example of foods that are "high" in FODMAPs.

Accurate quantification requires a number of analytical methodologies which are complex, expensive, and time consuming. Currently, all products used in our analysis are sampled from foods commonly consumed in Australia. Comparison with other results reported where samples were collected and tested in Europe and North America has shown generally good agreement. However, it is important to acknowledge that food products from other countries may yield different FODMAP results, due to food processing or nature of the ingredients.

Effects of FODMAPs on the Gut – Fluid Changes and Production of Intestinal Gas

In the small and large intestine, the small FODMAP molecules exert an osmotic effect, which means more fluid is drawn into the bowel. FODMAPs are also rapidly fermented by colonic microflora producing gas. The increase in fluid and gas distends the bowel. This can cause the sensation of bloating and abdominal pain or discomfort, and affects how the muscles in the wall of the bowel contract. It may cause increased forward movement (peristalsis) leading to diarrhea, but in some people, it can cause constipation.

It is important to appreciate that malabsorption of FODMAPs occurs to the same extent in healthy people and is a normal phenomenon. It is only in IBS that gut symptoms are induced more readily. The reasons for this may include:

a) The way the muscles of the bowel respond (motility) to the distension: They could result in faster or slower passage through the gut.
b) The gut is "hypersensitive" to changes in the gut environment and to interactions with the nervous system and immune system within the digestive tract: This means that IBS individuals are more likely to perceive pain at a lower threshold when distension of the bowel is present compared to healthy adults.
c) The type of bacteria in the bowel: The bowel bacteria might produce larger amounts of gas or there may be increased bacterial numbers in the small intestine (called small bacterial overgrowth) so that more gas is produced in the small bowel. Distension of the small bowel can cause increased abdominal discomfort, distension, and bloating.

From Science to Application

The application of the low FODMAP diet requires the expert guidance of a dietician trained in the area. A typical approach would involve restricting problematic FODMAPs for 6–8 weeks, or until good symptomatic control is achieved. This is done by substituting high FODMAP foods with lower options, or by reducing the total FODMAP load consumed at each meal or across the day. After this, small amounts of FODMAP-containing foods are re-introduced through challenges as advised by the dietician. The aim of challenging is to gradually increase to levels well-tolerated by the individual, while widening the diet as much as possible. Table 3 shows a sample menu plan for following the low FODMAP diet.

Application of the low FODMAP diet is not only limited to IBS. It has also been shown to improve gut symptoms in more than 50% of patients with inflammatory bowel disease who are experiencing ongoing gut symptoms despite having inactive disease. In patients without a colon, the issue of frequent loose stool production was also reduced significantly.

Testing for Sugar Malabsorption via Breath Hydrogen Testing

Breath hydrogen tests are useful to identify which partly absorbed sugars – fructose, lactose, and the sugar polyols, behave as FODMAPs for the individual. (No breath tests are performed for fructans and GOS [galactooligosaccharides] since they will be malabsorbed in everyone.)

The principle of breath testing is based on bacterial fermentation of the unabsorbed sugar in the intestine and this generates hydrogen gas. Some of this gas is then released into the bloodstream and excreted via the breath. Detection of high breath hydrogen after ingestion of a test sugar confirms that the test sugar has been malabsorbed. Some people do not produce much hydrogen; many will produce methane instead and this can also be detected in the breath. For a minority (less than 2%) of the community who do not produce breath hydrogen or methane, breath tests do not provide useful information. It is recommended that these individuals still implement the low FODMAP diet followed by food challenges for each FODMAP under the supervision of a dietician.

Other Factors if the Low FODMAP Diet is not Working

Consider all dietary triggers, acknowledging caffeine, alcohol, and fats can act as irritants to the gut (intake in moderation is often advised). Other strategies for treating IBS symptoms include non-celiac gluten intolerance and food chemical sensitivities.

In celiac disease, gluten triggers an immune response in the intestinal wall, causing inflammation and malabsorption of nutrients. A very strict gluten-free diet is the only recognized treatment to reverse abnormalities and prevent further damage to the intestine. All gluten-containing grains such as wheat, barley, rye, and oats are excluded. The low FODMAP diet is low in rye, wheat, and barley as these grains contain fructans. While following the low FODMAP diet, it is not necessary to follow the very strict "gluten-free" diet required by individuals with celiac disease.

Does Non-Celiac Gluten Intolerance Exist?

Very recent research undertaken by our group has confirmed the existence of gluten intolerance in people with IBS *without* celiac disease. This clinical trial demonstrated that participants on a low FODMAP diet experienced significantly worse symptoms of bloating, pain, tiredness, and dissatisfaction with stool habits after 6-weeks of gluten ingestion. Hence, gluten intolerance may be taken into consideration if individuals are not achieving adequate symptom-control on the low FODMAP diet. It is vital; however, that a gluten free diet is *not* commenced without discussion with your dietician or physician to ensure that celiac disease has been investigated prior to gluten withdrawal.

Other Health Considerations

A wide number of health benefits have been attributed to some FODMAPs. Fructans, inulin, and GOS are well known prebiotics, stimulating the growth of beneficial bacteria in the gut. For this reason it is important to note that the "Low FODMAP diet" is *not* a "No FODMAP diet" and it is *not* a "lifetime diet." We recommend that this diet is followed for 6–8 weeks and then your progress is reviewed by a dietician who will help advise which foods (and how much) can be gradually re-introduced into your diet. The dietician will also ensure that your diet is nutritionally adequate for you. Many people can return to their usual diet with just a few high FODMAP foods that need to be avoided.

Happily Ever After

The low FODMAP approach is a new treatment, and much of the dietary advice should translate well into other countries. Indeed, this approach has recently been adopted very successfully by a team at King's College in London.

The low FODMAP diet can be tailored to meet an individual's lifestyle and preferences. Following the low FODMAP approach does not cure IBS, but allows successful drug-free management of symptoms through diet in many patients.

Table 1. What are FODMAPs?

What are FODMAPs?
There are several different type of short-chain carbohydrates that make up the FODMAP family. Some foods containing these are:
• ***Oligosaccharides:*** These comprise fructans (fructo-oligosaccharides or FOS), which are made up of short chains of fructose with a glucose on the end, and galacto-oligosaccharides (GOS), which are short chains of sucrose and galactose units. These oligosaccharides are unable to be digested as humans do not have enzymes to break them down. Hence, they are not absorbed in the small intestine by anyone and, therefore, can cause problems for all patients with IBS. • ***Polyols:*** These are sugar alcohols and the most common ones in the diet are sorbitol and mannitol. Because their absorption is slow across the intestinal barrier, only about one-third of what is consumed is actually absorbed. Because of this, sorbitol is often used as a low-calorie sweetener in "sugar free" products, especially candies and chewing gum. • ***Excess fructose:*** Fructose is a simple sugar and requires no digestion. However, the absorption of fructose relies on the activity of sugar transporters that are located in the wall of the small intestine. Fructose is absorbed in two different ways, all depending on how much glucose is present in a food. Firstly, if glucose is present in equal or greater amounts than fructose, the glucose seems to piggyback the fructose across the small intestinal barrier. Secondly, if fructose is in excess of glucose, it requires an alternative absorption method. This method of absorption is impaired in some individuals and is the cause of fructose malabsorption. Around 30–40% of healthy and IBS individuals malabsorb excess fructose. • ***Lactose:*** Lactose is a disaccharide, made up of two sugar units. It needs to be broken down into individual sugar units by an enzyme called *lactase* prior to absorption. Hence, lactose is only a FODMAP when there are insufficient levels of *lactase,* which can be influenced by factors such as genetics, ethnicity (almost 100% of Asians and American Indians have low lactase levels) and many gut disorders.

Table 2. High FODMAP containing foods

<table>
<tr><th rowspan="2">Excess fructose</th><th rowspan="2">Lactose</th><th rowspan="2">Fructans (fructo-oligosaccharides) & Galacto-oligosaccharides</th><th colspan="2">Polyols</th></tr>
<tr><th>Sorbitol</th><th>Mannitol</th></tr>
<tr><td rowspan="2"><u>Fruits:</u>
Apples, cherries, mango, pears, tinned fruit in natural fruit juice, watermelon, large quantities of fruit juice or dried fruit

<u>Vegetables:</u>
Asparagus, artichokes, sugar snap peas

<u>Sugars:</u>
Honey, high fructose corn syrup</td><td rowspan="2"><u>Milk & Yogurts:</u>
Regular and low fat milk and yogurts

<u>Dairy Products:</u>
Soft cheeses (e.g. ricotta, cottage, cream cheese); custard, ice-cream</td><td rowspan="2"><u>Grains:</u>
Rye and rye products (e.g. rye bread, rye crackers); Wheat and wheat products (e.g. wheat bread, pasta, couscous, wheat bran)

<u>Fruits:</u>
Peaches, persimmon, watermelon

<u>Vegetables:</u> Artichokes, legumes (e.g. baked beans, lentils, red kidney beans); onion and garlic and garlic salts etc.

<u>Others:</u>
Inulin (often called fiber in nutritional supplements and products)</td><td><u>Fruits:</u>
Apples, apricots, pears, blackberries, nectarines, plums

<u>Beverages:</u>
Apple and pear juice</td><td><u>Vegetables:</u>
Cauliflower, mushrooms, snow peas

<u>Fruits:</u>
Watermelon</td></tr>
<tr><td colspan="2"><u>Sweeteners:</u>
Sugar-free gums, hard candies and chocolates containing sorbitol, mannitol, xylitol isomalt, maltitol</td></tr>
</table>

Table 3. Menu guide for a low FODMAP diet (avoid using ingredients listed in Table 2)

Breakfast	• Gluten-free or spelt toast with spread (sucrose sweetened, *not* with fructose) • Cereal (e.g. oats, Corn Flakes, Rice Krispies) • Tea or coffee (if you have lactose malabsorption, use lactose-free milk) • Serve of suitable fruit • Poached eggs and spinach
Lunch	• Gluten-free or spelt sandwich with fillings (e.g meat, salad, cheese) • Frittata • Homemade soup with low FODMAP vegetables • Green salad with dressing (olive oil, lemon juice) with tuna • Roast pumpkin, goats cheese & quinoa salad
Dinner	• Meat or fish with low FODMAP vegetables or salad • Baked fish with middle eastern vegetable quinoa • Roast chicken with rosemary infused vegetables and brown rice • Gluten free pizza base topped with cherry tomatoes, basil, goats cheese, ham and pineapple
Snacks & sweets	• Serve of suitable fruit • Yogurt (if you have lactose malabsorption, use lactose-free yogurt) • Rice cakes with feta • Gluten-free biscuits • Berry crumble

*For more information, visit **http://www.med.monash.edu/cecs/gastro/fodmap/**. Contact IFFGD for references used in this article.*

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