

Carol Rees Parrish, R.D., M.S., Series Editor

The Role of Food and Dietary Intervention in the Irritable Bowel Syndrome



Arthi Sanjeevi



Donald F. Kirby

Irritable Bowel Syndrome is described as a constellation of symptoms; however, the diagnosis is often one of exclusion after considering other etiologies for similar symptomatology. The role of diet and its effect on patients is often underestimated. The common provocative dietary agents and potential mechanisms that induce symptoms of IBS including abnormal intestinal gas are described. This review also provides suggestions for nutritional intervention. Finally, the evidence behind popular herbal supplements is discussed.

INTRODUCTION

Irritable Bowel Syndrome (IBS) has long been considered a diagnosis of exclusion. It is important to make sure that during the evaluation there are no “red flags” that suggest an alternate etiology for the patient’s symptom complex (Table 1) (1). Specifically, Inflammatory Bowel Disease (IBD) and cancer are important diagnoses that should be considered. In addition, Celiac Disease is being increasingly recognized as it is a common medical condition that affects one in 133 people (2). Patients with celiac disease may have gastrointestinal symptoms that can be attributed

Arthi Sanjeevi, M.D., Assistant Professor of Medicine and Donald F. Kirby M.D., FACP FACN FACG AGAF CNSP CPNS, Professor of Medicine, Psychiatry, Biochemistry and Molecular Biology, Division of Gastroenterology, Section of Nutrition, Virginia Commonwealth University Medical Center, Richmond, Virginia.

to IBS. Diet certainly can affect gastrointestinal symptoms for a number of reasons. This article will examine the role of diet in both the possible genesis and treatment of IBS-related symptoms.

IBS DEFINITION AND CONCEPTS

Irritable Bowel Disorder is a chronic gastrointestinal condition per the Rome III criteria that fits the following description (3):

- Recurrent abdominal pain or discomfort at least 3 days per month in the last 3 months
- Symptom onset at least 6 months prior, associated with 2 or more of the following:
 - Improvement with defecation; and/or
 - Onset associated with a change in frequency of stool; and/or
 - Onset associated with a change in form (appearance) of stool

Table 1
“Red Flags” to be considered before IBS is diagnosed (1)

- Significant weight loss
- Nocturnal awakening due to symptoms
- Fever
- Blood in stools
- New onset or progressive symptoms
- Onset after age 50 years
- Recent antibiotic use
- Family history of GI cancers or inflammatory bowel disease

While almost everyone may experience these symptoms occasionally, patients with IBS may find that the symptoms may be so frequent and incapacitating that they result in significant compromise of their lifestyle and quality of life. The disorder affects approximately 15% to 20% of the world's population and in the western countries it is predominately found in women (4,5). Interestingly, data from the Hispanic, African and Asian population do not show a significant female preponderance (6–9). US and UK data indicated a total direct cost estimate per patient per year ranging from \$348 to \$8,750; indirect costs ranged from \$355 to \$3,344. The average number of days off work per year because of IBS was between 8.5 and 21.6 (10). Thus the economic disease burden is also substantial.

Several mechanisms have been proposed as the causative factor including abnormal gut motility, visceral hypersensitivity and imbalance of the dysbiotic over the probiotic flora of the gut. In the latter condition the replacement of the symbiotic and commensal organisms in the gut by their atypical and more virulent counterparts have been shown to upregulate the immune response, stimulate the enterochromaffin cells resulting in the undesired GI side effects in patients with IBS (11,12). Additionally, stress has clearly been shown to aggravate symptoms (13). The predominant treatment approach has been to treat the resultant symptoms such as diarrhea, constipation and abdominal pain with empiric medication without measures to reduce or eliminate the source of noxious stimuli to the gut.

FOODS ASSOCIATED WITH INTOLERANCE

Perceived food intolerance, defined as symptoms related to intake of food, with or without objective findings, is reported by 25%–65% of patients with IBS (14). It has been linked to immunological, allergic, toxic and psychiatric mechanisms. The gut is regulated and controlled by food-induced neuropeptides that mediate changes in motility and intestinal function. IBS patients exhibit increased meal stimulated sigmoid motility and increased food induced serotonin secretion. Suggested here is a simple and practical approach to dietary management of IBS.

Milk and IBS

A third of the patients have been shown to have lactose intolerance, however, many patients with intolerance to milk products are not lactase deficient (enzyme that digests the lactose in the milk). Milk contains many substances that may stimulate the GI tract such as lactose, fats, and sugars, as well as those with immunogenic properties, such as proteins and immunoglobulins. Patients often fail to recognize that cheese, chocolate, and ice cream are concentrated forms of milk (and are all high in fat). Skim milk and lactose free products may help some, but for many, switching to soy or rice milk may be the only tangible option. Another problem is that milk products are used as additives in many different snacks and foods. Reviewing ingredient lists on the packaging may be useful. Breath hydrogen testing may help identify those with lactose intolerance, but a trial of complete and total abstinence of at least three weeks of all milk and related products to assess resolution of symptoms followed by reintroduction to test for recurrence of symptoms would be a more definitive means of evaluating for milk intolerance. In some patients, the presence of small bowel bacterial overgrowth may result in a false positive breath hydrogen test. Table 2 refers to an exhaustive but not a complete source of milk and related products. Table 3 lists suggested potential alternatives.

INTESTINAL GAS HANDLING IN IBS

IBS patients frequently report excess flatulence. It is normal to pass anywhere from a half a pint to 2 quarts

(continued on page 37)

(continued from page 34)

Table 2
Milk and related products

- Whole milk, reduced fat, fat free skimmed, lactose free after optional homogenization and/or pasteurization
- Cream (the fat skimmed off the top of milk) i.e. heavy cream, whipped cream, half and half, clotted cream, Kaymak (cream from water buffalo)
- Sour cream (fermented by the bacteria), Crème fraîche (slightly fermented cream), Smetana (central and Eastern European variety of sour cream)
- Powdered milk, evaporated milk, condensed milk
- Infant formula (milk based)
- Cultured and confectionery powders
- Cheese: Ricotta, cream, cottage, etc. and lesser known imported cheese variants such as khoa, paneer, quark, Fromage frais
- Butter, Ghee (clarified butter)
- Yogurts, curds, cultured buttermilk, whey, ayran, lassi, kefir, Viili, Filmjolk (Swedish fermented milk)
- Ice creams, frozen yogurt, frozen custard, gelato, Vla (Dutch, form of custard), dulce de leche (partially caramelized sweetened milk)
- Casein products: Caseinates, milk protein concentrates and isonates, whey protein concentrates and isonates, hydrolysates
- Baked products with milk and related products

of gas in a normal person. Associated symptoms such as abdominal discomfort, bloating, inability to control passage of gas and malodor are the usual symptoms experienced by patients complaining of “gas problems.” Fiber supplementation has traditionally been the first empiric treatment option for IBS symptoms. They can broadly be subdivided into two classes; soluble fiber (found in oat bran, fruits, psyllium husk and beans) and insoluble fiber (found in whole wheat, corn bran and flax seed and vegetables such as celery, green beans and potato skins). Soluble fiber has been purported to be better for constipation predominant IBS while the insoluble fibers have been described to be less gas producing as they not fermented like the soluble fiber (15, 16). However in controlled trials and systematic reviews fiber in general has marginal benefit in treatment of overall IBS symptoms. It does increase the total volume and frequency of stools but may worsen symptoms in patients with a predominant complaint of gas bloat (17,18).

Table 3
Non-dairy milk alternatives

Grain source

- Rice (Amazake, Rice Dream, Pacific rice beverage, Harmony Farms, Westbrae Natural)
- Oat (Pacific organic oat beverage)
- Triticale (Pacific Multi-grain Beverage)
- Barley (Orzo roasted barley drink)
- Quinoa (NorQuin brand quinoa powder)

Bean source

- Soymilk (Soysilk, Soy Dream)

Nut source

- Almond (AlmondJool, Almond Breeze), Hazelnut, Walnut, Peanut Milk

Fruit

- Coconut milk

Incompletely digested carbohydrate such as lactose in milk (in those patients with lactose intolerance), fructose in fruits and high-fructose corn syrup; raffinose in vegetables such as cabbage, cauliflower and broccoli; and sorbitol in artificial sweeteners and Nicorette and other gums may produce more gas as a byproduct of bacterial fermentation. Due to their osmotic activity and rapid fermentability dietary FODMAPs (Fermentable Oligo-, Di- and Monosaccharides and Polyols) lead to excess luminal distension and potentiate a visceral hypersensitive response; a comprehensive discussion of this topic is available elsewhere (19). Aerophagia is another cause of excess gas, habitual gum chewing, carbonated beverages, smoking, rapid consumption and air-filled foods by means of whipping causes excess air ingestion.

Physical inactivity slows intestinal transit and mild physical activity has been shown to enhance intestinal gas clearance and reduces symptoms in patients complaining of abdominal bloating (20). A large cross-sectional population-based study of over 1,000 subjects revealed reduced quality of life in people with abdominal bloating. In this study interestingly smoking and high-dose aspirin were associated with bloating while physical activity was not (21). Regular physical activity should be encouraged, however results may be variable.

Table 4
Foods that aggravate symptoms of IBS (20)

- Milk
- Caffeinated beverages
- Alcohol
- Fruits (especially apples, citrus fruits and tomatoes)
- Spices, condiments and seasoning
- Diet beverages and foods
- Fast foods
- Chinese food
- Fried and fatty foods
- Whole grain or multigrain breads
- Additive ingredients in salads
- Certain vegetables such as cabbage, broccoli, cauliflower and corn
- Legumes and beans
- Red and processed meats
- Preservatives, artificial flavoring and coloring
- Substance high in insoluble fiber
- Baked products

Table 5
Foods that are well tolerated in IBS (20)

- Water, flavored noncarbonated water
- Non-caffeinated and non-diet drinks
- Steamed rice, plain pasta and noodles
- Potatoes—boiled or baked without additives
- Sweet potatoes
- Plain breads
- Broiled fish
- Chicken, turkey (without spices)
- Non-smoked ham
- Eggs
- Cereals without artificial flavoring and coloring
- Soy products
- Salads with oil and vinegar dressing
- Cooked vegetables such as peas and carrots
- Crackers
- Fruits such as melons and peaches
- Margarine
- Peanut butter

OTHER COMMON CULPRITS

Based on patients self report at one center with a large IBD and IBS patient population base, a comprehensive list of food groups found to have a high predilection for inducing and aggravating IBS have been compiled (Table 4) (22). In recent years fructose malabsorption has received substantial attention. The interplay of multiple mechanisms including low absorption of fructose especially in the presence of inadequate glucose, rapid small bowel transit and small bowel bacterial overgrowth have been described (23).

With the above mentioned intimidating long list of food substances the next most obvious question is “What can I even eat short of starvation?” Interestingly, a novel study was done in Japan where IBS patients were subjected to 10 days of starvation therapy followed by five days of refeeding in conjunction with psychotherapy. This group of patients, in comparison to the control subjects undergoing basic symptomatic treatment, had significant resolution of symptoms (24). Applicability of this particular therapy in our patient population may be unacceptable and impractical; however, this suggests food substances being a major player in perpetuating symptoms of IBS.

WELL-TOLERATED FOODS AND BEVERAGES IN IBS PATIENTS

Certain food substances have been proposed to be well tolerated in the above mentioned IBD population based on direct patient feedback with IBS overlap (Table 5) (22). For written diet materials for irritable bowel syndrome, go to: <http://www.healthsystem.virginia.edu/internet/digestive-health/nutrition/patientedu.cfm>

A practical option would be to have patients maintain an accurate food diary to document details of all meals, the time of onset of symptoms, and the symptom severity in an attempt to allow the patient and their physician to have better recognition of an offending food substance. The next step would be complete elimination of all suspected offensive agents until remission of all symptoms occur. Subsequent to this a gradual reintroduction of one food product at a time, monitoring for recurrence of symptoms should be done. Eventually the patient would be able to prudently identify food substances that need to be completely avoided and those that could be tolerated when consumed sporadically and in moderation. However, a certain subset of patients may have a delayed manifes-

(continued on page 41)

(continued from page 38)

tation of symptoms that may make the identification of a noxious agent nearly impossible. Therefore, this process would require a highly motivated patient who could eliminate all of the food groups that have shown to aggravate IBS symptoms and initiate a diet plan starting with the most tolerable substance (water), and slowly adding back well tolerated food substances every few days. If there is a severe recurrence of symptoms, that food substance may need to be permanently avoided, or in case of a mild recurrence, a rotational plan of only consuming the food product once in a period of a few days has been proposed (22).

Identification of food allergies and intolerances by means of allergy testing of skin and blood has been supported by some (25). Although these tests have a good negative predictive value there is a high rate of false positive results and they are seldom comprehensive. This makes their clinical utility questionable especially in patients with IBS type symptoms (26). More data is required to include allergy testing as a standard of care.

ROLE OF PROBIOTICS IN IBS

Epidemiological evidence of post-infectious and post-antibiotic IBS indicates a qualitative or a quantitative change in the gut flora that may cause subtle mucosal and enteric neuronal inflammation that may contribute to IBS symptoms. A relative decrease in the population of bifidobacteria has been a consistent finding in many studies (27,28). The specific type of probiotic species that might yield the maximum benefit has been evaluated in randomized controlled trials. *Bifidobacterium infantis* has shown superiority over both *Lactobacillus* and placebo in improving the cardinal symptoms of IBS that includes abdominal pain or discomfort, bloating or distention, and bowel movement difficulty, (29,30).

SUMMARIZED DATA ON ALTERNATIVE THERAPY FOR IBS

- Soluble fibers as in grains, cereal, beans, flax seed and supplements such as psyllium husk (Metamucil, FiberMucil), Methylcellulose (Citrucel), Calcium polycarbophil (Fibercon) and wheat dextrin (Bene-

fiber) are more effective than insoluble fibers (green leafy vegetable, wheat bran, corn fiber) in relieving constipation, although fiber in general has marginal benefit in treatment of overall IBS symptoms (31).

- A recent double blinded randomized study has shown superiority of peppermint oil over placebo. Two enteric coated pills twice a day reduced the symptom score in 75% of patients by more than 50% as compared to only 38% of the patients on a placebo and the effects were preserved four weeks after therapy (32).
- There are anecdotal reports of impressive response to the fruit of *Euterpe oleracea* (commonly known as acai berry that has been demonstrated to exhibit significantly high antioxidant capacity *in vitro*, especially for superoxide and peroxy scavenging), but there are no published clinical trials thus far evaluating clinical response in IBS (33).
- The following supplements commonly believed to be beneficial in IBS have no published studies to support their use (chamomile tea, evening primrose oil, fennel seeds, wormwood oil and comfrey).

CONCLUSION

For a subset of IBS patients, the complex interplay of multiple underlying pathophysiologies may require that nutritional intervention be uniquely tailored for an individual patient. In collaboration with the physician and perhaps a nutritionist, the patient may need to

Table 6
Approach to Patient with IBS

- Establish therapeutic patient-physician relationship
- Identify patients with "Red Flag" symptoms for further investigation
- Obtain detailed history of illness
- Encourage documentations of symptoms and dietary intake in a food diary
- Exclude the usual culprits from diet and introduce the tolerable foods
- Consider treatment with antibiotics/ probiotics
- Educate patients against indulgence in expensive therapy of unproven benefit

chart their individualized approach for dietary manipulation (Table 6). A food diary kept by IBS patients can be very useful to establish possible food triggers that exacerbate symptoms. Thus many patients with IBS may benefit from dietary intervention; however, adherence to recommendations may be arduous for many. Dietary changes require a motivated patient and can be rather time consuming; but for the committed patient there is a potential for easing of symptoms. ■

References

- Vanner SJ, Depew WT, Simon JB, et al. Predictive value of the Rome criteria for diagnosing the irritable bowel syndrome. *Am J Gastro*, 1999; 94:2912-2917.
- Fasano A, Berti I, Horvath K, et al. Prevalence of celiac disease in at-risk and not-at-risk groups in the United States: a large multicenter study. *Arch Intern Med*, 2003;163:286-292.
- Rome Foundation. Guidelines—Rome III Diagnostic Criteria for Functional Gastrointestinal Disorders. *J Gastrointestinal Liver Dis*, 2006;15:307-312.
- Drossman DA, Sandler RS, Lovitz AJ, et al. Bowel patterns among subjects not seeking health care. Use of a questionnaire to identify a population with bowel dysfunction. *Gastroenterology*, 1982;83:529-534.
- Jones R, Lydeard S. Irritable bowel syndrome in the general population. *BMJ*, 1992;304: 87-90.
- Barakzai MD, Gregory J, Fraser DJ. The effect of culture on symptom reporting: Hispanics and irritable bowel syndrome. *Am Acad Nurse Pract*, 2007;19:261-267.
- Yilmaz S, Dursun M, Turhanoglu A, et al. The epidemiological aspects of irritable bowel syndrome in Southeastern Anatolia: a stratified randomised community-based study. *Int J Clin Pract*, 2005;59:361-369.
- Ladep NG, Okeke EN, Malu AO, et al. Irritable bowel syndrome among patients attending General Outpatients' clinics in Jos, Nigeria. *Eur J Gastroenterol Hepatol*, 2007; 19:795-799.
- Gwee KA, Wee S, Wong ML, Png DJ. The prevalence, symptom characteristics, and impact of irritable bowel syndrome in an asian urban community. *Am J Gastroenterol*, 2004;99:924-931.
- Maxion-Bergemann S, Thielecke F, Bergemann R, et al. Costs of irritable bowel syndrome in the UK and US. *Pharmacoeconomics*, 2006;24:21-37.
- Barbara G, Wang B, Corinaldesi R, et al. Mast cell-dependent excitation of visceral-nociceptive sensory neurons in irritable bowel syndrome. *Gastroenterology*, 2007;132:26-37.
- Walker WA. Role of nutrients and bacterial colonization in the development of intestinal host defense. *J Pediatr Gastroenterol Nutr*, 2000; 30:S2-S7.
- Hertig VL, Cain KC, Heitkemper MM, et al. Daily stress and gastrointestinal symptoms in women with irritable bowel syndrome. *Nurs Res*, 2007;56:399-406.
- Locke GR, Zinsmeister AR, Melton LJ, et al. Risk factors for irritable bowel syndrome: role of analgesics and food sensitivities. *Am J Gastroenterol*, 2000;95:157-165.
- Chang HY, Kelly EC, Lembo AJ. Current gut-directed therapies for irritable bowel syndrome. *Curr Treat Options Gastroenterol*, 2006;4:314-323.
- Lynch A, Webb C, Sams R 2nd. What are the most effective non-pharmacologic therapies for irritable bowel syndrome? *J Fam Pract*, 2008;57:57-58.
- Rees G, Davies J, Liepins P, et al. Randomised-controlled trial of a fibre supplement on the symptoms of irritable bowel syndrome. *J R Soc Health*, 2005;125:30-34.
- Quartero AO, Meineche-Schmidt V, de Wit N, et al. Bulking agents, antispasmodic and antidepressant medication for the treatment of irritable bowel syndrome. *Cochrane Database Syst Rev*, 2005;2:CD003460.
- Barrett JS, Gibson PR. Clinical ramifications of malabsorption of fructose and other short-chain carbohydrates. *Practical Gastroenterology*, 2007;7:51-65.
- Villoria A, Serra J, Malagelada JR et al. Physical activity and intestinal gas clearance in patients with bloating. *Am J Gastroenterol*. 2006;101:2552-2557.
- Tuteja AK, Talley NJ, Hickam DH et al. Abdominal bloating in employed adults: prevalence, risk factors, and association with other bowel disorders. *Am J Gastroenterol*. 2008 May;103(5): 1241-1248.
- MacDermott RP. Treatment of Irritable Bowel Syndrome in Outpatients with Inflammatory Bowel Disease Using a Food and Beverage Intolerance, Food and Beverage Avoidance Diet. *Inflamm Bowel Dis*, 2007;13:91-96.
- Gibson PR, Newnham E, Barrett JS, et al. Fructose malabsorption and the bigger picture. *Aliment Pharmacol Therap*, 2006;25:349-363.
- Kanazawa M, Fukudo S. Effects of fasting therapy on irritable bowel syndrome. *Int J Behav Med*, 2006;13:214-220.
- Jun DW, Lee OY, Cho SH, et al. Food intolerance and skin prick test in treated and untreated irritable bowel syndrome. *World J Gastroenterol*, 2006;12:2382-2387.
- Hamilton RG, Adkinson NF Jr. Clinical laboratory assessment of IgE-dependent hypersensitivity. *J Allergy Clin Immunol*, 2003;111:S687-S701.
- Malinen E, Rinttila T, Kajander K, et al. Analysis of the fecal microbiota of irritable bowel syndrome patients and healthy controls with real-time PCR. *Am J Gastroenterol*, 2005;100:373-382.
- Matto J, Maunuksela L, Kajander K, et al. Composition and temporal stability of gastrointestinal microbiota in irritable bowel syndrome—a longitudinal study in IBS and control subjects. *FEMS Immunol Med Microbiol*, 2005;43:213-222.
- Whorwell PJ, Altinger L, Morel J, et al. Efficacy of an encapsulated probiotic Bifidobacterium infantis 35624 in women with irritable bowel syndrome. *Am J Gastroenterol*, 2006;101: 326-333.
- Kim HJ, Camilleri M, Zinsmeister AR, et al. A randomized controlled trial of a probiotic, VSL#3, on gut transit and symptoms in diarrhea-predominant irritable bowel syndrome. *Aliment Pharmacol Ther*, 2003;17:895-904.
- Chang HY, Kelly EC, Lembo AJ. Current gut-directed therapies for irritable bowel syndrome. *Curr Treat Options Gastroenterol*, 2006;9:314-323.
- Cappello G, Spezzaferro M, Marzio L, et al. Peppermint oil in the treatment of irritable bowel syndrome: A prospective double blind placebo-controlled randomized trial. *Dig Liver Dis*, 2007;39:530-536.
- Lichtenthaler R, Rodrigues RB, Marx F, et al. Total oxidant scavenging capacities of Euterpe oleracea Mart. (Açaí) fruits. *Int J Food Sci Nutr*, 2005;56:53-64.

PRACTICAL
GASTROENTEROLOGY