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**Talking points**

- The link between FODMAP intake and gastrointestinal symptoms in IBS
- Selecting the ideal client/patient for the low-FODMAP diet
- The three distinct phases of the low-FODMAP protocol

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### What is IBS?

Based on Rome IV criteria-

- Recurrent **abdominal pain** 1 day per week associated with 2 or more of the following:
  - Related to defecation
  - Onset associated with a change in the frequency of stool
  - Onset associated with a change in the form of stool

Criteria should be fulfilled for the last 3 months with symptom onset  $\geq$  6 months before diagnosis

Manfred et al. Gastroenterology 2014; 126:1389-9407

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### Self-reported food-related IBS symptoms are common and associated w/ reduced quality of life

Food Category	Patients (%)
Any food	84
Carbohydrates	70
Fatty foods	52
Histamine	58

- 197 IBS patients (Rome III)
- Symptom severity correlates with number of food sensitivities
- No impact of IBS subgroup
- Carb triggers noted: dairy, beans, apple, wheat flour, plum (FODMAP sources)

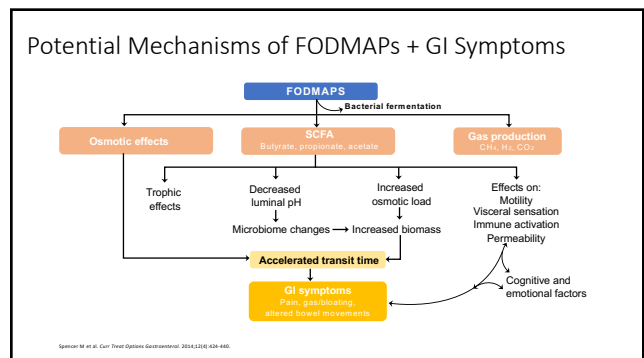
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### FODMAP acronym:

- F** fermentable
- O** oligosaccharides (fructans and galacto-oligosaccharides-GOS)
- D** disaccharides (lactose, milk sugar)
- M** monosaccharide (excess fructose)
- A** and
- P** polyols (sugar alcohols such as mannitol and sorbitol)

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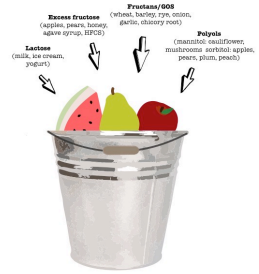
### Why are FODMAPs malabsorbed?

- **Lactose:** Up to 70% of the world population has lactase non persistence, also secondary LI observed in post-infectious IBS & SIBO
- **Fructose:** poor absorption due to it's slow, low-capacity transport mechanism across the epithelium; FM occurs in 1 in 3 ppl (not always associated with digestive distress)
- **Fructans/ GOS:** humans lack digestive enzymes
- **Polyols:** too large for passive diffusion; absorbed in pores in small intestine. Larger pores proximally, pore size diminished along w/ > malabsorption with inflammation

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FODMAPs effects are cumulative



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### Systematic Reviews and Meta-Analyses of LFD in IBS

#### Meta-analysis of 12 studies of LFD in IBS<sup>1</sup>

- LFD reduced IBS symptom severity by a moderate-to-large extent compared with control diet
  - Standardized mean difference -0.66 (95% CI -0.88- 0.44  $P=54%$ )
- LFD associated with mean reduction in IBS-SSS of 45 points (95% CI -77-14,  $P=89%$ ) and improved QOL scores

#### Systematic review of studies of GFD (2 studies) or LFD (7 studies) in IBS<sup>2</sup>

- LFD diet reduced overall IBS symptoms with a risk reduction of remaining symptomatic on a low-FODMAP diet of 0.69 (95% CI, 0.54–0.88)
  - NNT=5 (95% CI 3–11)<sup>2</sup>
- GFD offered reduction of global symptoms but not statistically significant

GFD, gluten-free diet; IBS-SSS, Irritable bowel syndrome severity score; LFD, low-FODMAP diet; QOL, quality of life; Lact Lactin AS et al. *Am J Clin Nutr*. 2021;113(4):1018-1024. 2. Scarpini L, Ford AC et al. *Am J Gastroenterol*. 2016;111(12):1889-1900.

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### Selecting the right candidate for the LFD



- ✓ No evidence of eating disorder, maladaptive eating or extreme food fears
- ✓ Diet recalls reveal high FODMAP foods
- ✓ Eating exacerbates symptoms
- ✓ Nutritional approach to treatment is desired
- ✓ Celiac serology testing has been completed with adequate gluten intake

LFD should be considered 2<sup>nd</sup> line diet therapy. Strategies such as a trial of psyllium husk, clean up the diet with NICE guidelines -regular meal timing, balance to meals, less "junk food", alcohol, caffeine, and high fat foods.

Scarlata K. *Am J Gastroenterol*. 2016;111(12):1889-1900.

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### Potential Contraindication of FULL LFD

Contraindication	Potential negative impact of elimination diet	More flexible approach, "FODMAP Gentle or alternative therapy
Active eating disorder/ARFID	Further decline nutrition/psychological health	Supportive nutrition; liberalize diet, eating disorder specialist
Malnutrition	Nutritional status	FODMAP gentle
Unwillingness to change diet	Non-adherence	Alternative IBS therapies or FODMAP gentle
Poor capacity to follow diet (does not prepare own food/ food insecurity)	Non-adherence	FODMAP gentle or no therapy
Children	Food fears, development of good eating habits	FODMAP gentle
Other dietary restrictions in place	Nutritional status	FODMAP gentle

Adapted from Halmos EP, Gibson PR. *J Gastroenterol Hepatol*. 2019;34(7):1134-1142.

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### Flexible Approach to LFD: "FODMAP Gentle"

**RESTRICT ONLY**

- Grains**  
Wheat and rye
- Vegetables**  
Onion, leek, garlic, cauliflower, most mushrooms
- Fruit**  
Apple, pear, watermelon, dried fruit (larger quantities)
- Legumes**  
Beans not allowed on elimination LFD

- Dairy**  
Milk and traditional yogurt

The highest FODMAP foods in the patient's diet are minimized

Selection of foods to modify is best assessed via 24-hour intake and food frequency for individualized approach

Adapted from Halmos EP, Gibson PR. *J Gastroenterol Hepatol*. 2019;34(7):1134-1142.

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### LFD in IBD

Gastroenterology 2018;128:175-88

- N=52 IBD- quiescent disease
- LFD vs. control diet x 4 weeks.
- Gut symptoms, QOL, measure, Blood + fecal microbiome comp evaluated.
- Adeq relief of symptom reached by 52% on LFD vs 16% on control diet.
- LFD arm resulted in lower Bifidobacterium adolescentis, B. longum, F. prausnitzii compared to control diet.
- Microbiome diversity and markers of inflammation did not differ significantly btw groups.

**Effects of Low FODMAP Diet on Symptoms, Fecal Microbiome, and Markers of Inflammation in Patients With Quiescent Inflammatory Bowel Disease in a Randomized Trial**

Selma B. Cox,<sup>1</sup> James O. Lindsay,<sup>1,2</sup> Sebastien Fournier,<sup>1</sup> Andrew J. Stagg,<sup>3</sup> Neil E. McCarthy,<sup>4</sup> Nathalie Galbraith,<sup>5</sup> Samar B. Brajin,<sup>6</sup> Hugo Pourn,<sup>7</sup> Florence Lavernez,<sup>8</sup> Nicolas Pons,<sup>9</sup> Nicolas Michard,<sup>10</sup> Miranda C. Lomer,<sup>11</sup> S. Dusko Ehrlich,<sup>12</sup> Peter M. Irving,<sup>13</sup> and Kevin Whelan<sup>14</sup>

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Cox SB, et al. Gastroenterology. 2018;128(1):174-188.e7. doi:10.1053/j.gastro.2018.09.024

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### Athletes + diet

- Athletes (n = 73) completed a FODMAP-specific food frequency questionnaire.
- High FODMAP foods consumed during pre-race dinners + breakfasts, with over 60% reporting specific high FODMAP foods.
- Products: gel/gummies etc. often related to increased frequency of GI symptoms.
  - Of the 16 sports nutrition products tested, seven were high FODMAP in one serving.
- Average habitual FODMAP intake was 26.1 g (±15.9 g), "classified as high FODMAP" in previous research.
- FODMAP intake by endurance athletes is high both surrounding exercise + habitually and may be contributing to GI symptoms experienced during exercise.


**High Fermentable Oligosaccharides, Disaccharides, Monosaccharides, and Polyols (FODMAP) Consumption Among Endurance Athletes and Relationship to Gastrointestinal Symptoms**

Wright SA, et al. Front Nutr. 2021;8:637150. Published 2021 Apr 20.

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### LFD Athletes

- N=16 healthy volunteers crossover design manner to either a low FODMAP (16.06 ± 1.79 g·d<sup>-1</sup>) or high FODMAP (38.65 ± 6.66 g·d<sup>-1</sup>) diet x 7 days.
- 1 week washout period followed by a further 7 days on the alternate diet.
- Participants rated their GI symptoms on an adapted version of the (IBS-SSS) questionnaire before and at the end of each dietary period.
- Overall IBS-SSS score significantly reduced in the low FODMAP diet from 81.1 ± 16.4 to 31.3 ± 9.2 (P = 0.004).
- Perceived exercise frequency + intensity was significantly improved following a short-term low FODMAP approach compared to High FODMAP.



Wright SA, et al. Front Sports Nutr. 2018;2018:1-7. Published 2018 Jun 15.

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### IBS + Endometriosis: Role of LFD

Endometriosis: a chronic, estrogen-dependent inflammatory disorder characterized by the presence and growth of endometrial tissue outside the uterine cavity.

- Prevalence of endometriosis is 2%–10% in the general population of women of childbearing age, but it can even increase to 30%–33% in infertile women or women with chronic pelvic pain.
- A retrospective analysis of prospectively collected data from women attending a specialist IBS service in New Zealand.
- Data from those who met Rome III criteria for IBS were sorted into two groups: concurrent endometriosis and those with IBS alone.
- N=160 women IBS (Rome III) 36% had concurrent endometriosis.
- 72% of these women (IBS+ endometriosis) reported a >50% improvement in bowel symptoms after four weeks of a low FODMAP diet compared with 49% in those with no known endometriosis (P = 0.001, odds ratio 3.11, 95% CI, 1.5-6.2).

Moore RS, et al. Aust N Z J Obstet Gynaecol. 2017 Apr;57(2):201-205. Meuleman C, et al. Fertil Steril. 2009;92:68-74.

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### Full LF Elimination Diet: 3 Phases


	1	2	3
	<b>Elimination</b>	<b>Determine Sensitivities/ Reintroduction</b>	<b>Personalization</b>
Time frame	2-6 weeks	6-8 weeks	As needed for symptom management
Goal	Remove all high FODMAP foods in attempt to provide symptom resolution	Systematically add FODMAP subtypes back into diet to identify food triggers	Add back successfully reintroduced FODMAP foods to expand diet to personal tolerance

Scarlatà K. Am J Gastroenterol. 2019;114(2):189-191.


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### Phase 1: Elimination


In full elimination LFD, remove all high FODMAP foods from the diet and sub in low FODMAP alternatives.



Educate patient on essentials to grocery shop, label read, menu plan + eat a balanced diet.



Remind patient if diet changes are too stressful, diet change will be counterproductive.



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### Sample of Low-FODMAP Foods

**Grains/starches**  
white potato, rice, quinoa  
gluten free pasta/crackers/bread,  
slow-leavened wheat bread

**Vegetables**  
arugula, beet root (pickled), bell pepper, bok choy, broccoli (florets), cabbage (common/red), carrot, celeriac, collard greens, cucumber, Lettuce, parsnips, spaghetti squash, Swiss chard, spinach, taro, tomato, turnip, water chestnuts

**Fats**  
All plain oils and butter

**Fruits**  
banana(unripe), blueberries, cantaloupe, clementine, dragon fruit, grapes, kiwifruit, lemon/lime, orange, passionfruit, pineapple, starfruit, strawberries

**Protein**  
Most plain unseasoned meat, fish + poultry, Eggs and peanut butter, firm tofu, tempeh

**Dairy**  
Lactose free milk and lactose free yogurt, butter, hard or aged cheeses, lactose free cottage cheese

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### Sample of High-FODMAP Foods

**Excess fructose**  
Apples, boysenberry, figs, mango, pears, watermelon, asparagus, artichoke, sugar snap peas, high fructose corn syrup, honey, agave

**Lactose**  
Milk, custard, ice cream, yogurt, milk powder, ricotta cheese, cottage cheese

**GOS**  
Legumes, pistachios, cashews

**Polyols**  
Apples, apricots, blackberries, nectarine, peach, pears, cauliflower, mushrooms, sugar alcohol additives\*

**Fructans**  
Dried fruits, nectarine, persimmon, watermelon, artichoke, garlic, onion, wheat, barley, rye, chicory root extract, inulin additives

GOS: galacto-oligosaccharides. \*sorbitol, mannitol, xylitol, maltitol. © Shestakova et al. Clin Gastroenterol Hepatol. 2008;6(7):771-3. Shepherd SJ, Gibson PR. Clin Gastroenterol Hepatol. 2008;6(7):763-5. Eswaran SL, Chey WD. Gastroenterol Clin N Am. 2011;40:543.

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### Balance the plate!

- Include all food groups
- Focus on nutrient dense options
- Include favorites
- Don't forget about hydration

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### Fiber for gut health

#### How much fiber do you need?

Dietary fiber needs vary depending on age and gender per the Institute of Medicine.

**Guidelines for fiber needs are the following:**

**Men**  
4-8 years old >> 25 grams fiber/day  
9-13 years old >> 25 grams fiber/day  
14-50 years old >> 38 grams fiber/day  
50+ years old >> 30 grams fiber/day

**Females**  
4-8 years old >> 25 grams fiber/day  
9-13 years old >> 25 grams/day  
14-50 years old >> 25 grams/day  
50+ years old >> 21 grams/day

FOOD	AMOUNT	GRAINS OF FIBER	FOOD	AMOUNT	GRAINS OF FIBER
Almonds	1 oz	2.9g	Walnuts	1 oz	2.4g
Apples	1 medium	4.5g	Yogurt	1 cup	0.5g
Avocado	1 oz	2.9g	Zucchini	1 cup	1.0g
Bananas	1 oz	2.8g	...	...	...

Quagliariel D, Felt-Gunderson P. Am J Lifestyle Med. 2016;11(1):80-85. Published 2016 Jul 7. © 2021 www.katecristata.com

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### Flavor your foods

- Simple tips to help your patients maintain their favorite flavors in their diet
- Remind patient that not all FODMAPs will be restricted forever!

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### Menu planning

**Breakfast**

- Omelet with low FODMAP veggies + cheddar cheese
- Overnight or slow-cooker oats topped with walnuts, cinnamon, and raspberries.
- Prep mini crustless quiches + orange.
- Lactose free Greek yogurt with easy add ins: blueberries, chia seeds, GF granola.

**Dinner**

- Baked salmon brushed with Dijon mustard and maple syrup, 1/2 cup sweet potatoes, broccoli florets and orange.

**Pizza night!**

- GF pizza crust brushed with garlic infused oil, sliced tomatoes + shredded mozzarella. Bake then top with fresh chopped basil. Serve with salad.

**Lunch**

- Taco salad-taco meat topped over brown rice salad greens, tortilla chips and low FODMAP dressing.
- Tuna or egg salad on sourdough bread + grapes
- Firm tofu stir fry with soy sauce, sesame oil, and low FODMAP veggies over brown rice.

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### Phase 2: Basic Guidelines for Reintroduction

- Test one FODMAP group at a time** (eg, lactose, excess fructose etc.)  
Choose foods that contain only that FODMAP
- Consume food amount that represents a normal intake** (not excessive amounts)
- Continue restricting all FODMAPs** (maintain a low FODMAP diet) except the food that is being tested until tolerance or intolerance is confirmed
- Record symptoms** experienced for each challenge
- Use same food** for each of the 3 challenge days

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### Determine Sensitivities With These Foods

- Lactose**: ½ -1 cup milk
- Fructans**: 2 slice wheat bread, 1 TB onion, ½ garlic clove
- Fructose**: 1-2 TB honey or ½ mango
- GOS**: ½ cup beans
- Polyols**: ½ cup mushrooms, ½ cup cauliflower (mannitol) or 1 peach, 5 blackberries (sorbitol)

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### Recent data re: Reintroduction Phase

- 45 pts improved on LFD full elimination, 21 continued to reintroduction, 20 patients completed study
- Reintroduction doses were randomized and provided as:
  - FOS (low exposure 0.75g/day; high exposure 1.5 g/day), GOS (low 2 g/day; high 4 g/day), lactose (low 10 g/day; 20 g/day), sorbitol (5 g/day; 10 g/day)—contained in brownie
- 7-day wash-out btw challenge.

©2021 Poster Escobar S, Singh P, Bhatt S. Are all FODMAPs created equal? A blinded, randomized reintroduction trial to determine which FODMAPs drive clinical response in IBS patients.

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### Results –Reintroduction study

- Both abdominal pain + bloating increased irrespective of sequence of FODMAPs over time.
- Abdominal pain worse with fructans.
- When analysis was *restricted to first reintroduction*—GOS and fructans were significantly associated with abdominal pain.

©2021 Poster Escobar S, Singh P, Bhatt S. Are all FODMAPs created equal? A blinded, randomized reintroduction trial to determine which FODMAPs drive clinical response in IBS patients.

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Supplements to help expand diet!

**Lactase supplement to aid lactose digestion.**  
**Note: some supplements including “fast-act” — contain FODMAPs. Select appropriate option!**

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### Alpha-galactosidase

Be mindful of added ingredients in supplement recommendations

- Study in 31 (mixed presentation) of IBS pts
- The addition of high GOS foods resulted in a significant increase in overall symptoms with 21 patients exhibiting GOS-sensitivity.
- Of those, full-dose enzyme (300 GALU) reduced overall symptoms.
- Breath hydrogen production was minimal with no differences seen between placebo and full-dose (P=0.597).

Tsai CL, et al. Am J Gastroenterol. 2018 Jun;113(12):134-139.

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### Approach to LFD Non-Responders

Bloating and postprandial fullness	Rule out SIBO, gastroparesis
Constipation	Assess for slow transit constipation and/or dyssynergic defecation, high colonic stool burden, methane, and SIBO
Diarrhea	Parasitic infection, bile acid malabsorption, SIBO, CSID/SID
Other food intolerances/sensitivities	Wheat (atypical allergy), gluten, sucrose, food chemicals-histamine, milk protein (A1 vs A2)
Fat malabsorption	SIBO, EPI

*Consider gut-directed hypnotherapy or CBT—other gut-brain directed therapies*

CBT, cognitive behavioral therapy; CSID, congenital sucrose isomaltase deficiency; EPI, exocrine pancreatic insufficiency; SIBO, small intestinal bacterial overgrowth. ©2019 Sage Publications, 1001 N. Zeeb Road, Thousand Oaks, CA, USA.

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### Disordered Eating in GI Conditions

- 23.4% of patients with GI disease (n=691) displayed disordered eating patterns
- Dietary-controlled GI disorders:
  - Lifelong modifications to diet may aid in reducing symptoms associated with disruptions to the GI tract: nausea, bloating, diarrhea, constipation, weight changes, abdominal pain

Celiac Disease	IBS and IBD
Necessary to follow strict, life-long gluten free diet.	<ul style="list-style-type: none"> <li>Often use trial and error regimens to identify food triggers.</li> <li>2/3 of IBS pts attribute food they eat to abdominal sx.</li> <li>41-52% of eating disordered pts have IBS.</li> </ul>

Carrozzini et al. Appetite. 2015; 94:242-50. Karel A, Drossel M. Influence of Dietary Restriction on Irritable Bowel Syndrome. Am J Gastroenterol. 2019;114(2):212-20. doi:10.1038/s41385-019-0549-4. Food restriction, symptoms and disorders in patients with eating disorders. Int J Eat Disord. 2019;42(1):1-10.

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### For more on this topic, tips for screening for eating and feeding disorders

Clinical Gastroenterology and Hepatology 2020;18:543-545

#### HERE AND NOW: CLINICAL PRACTICE

Charles J. Kahi, Section Editor

#### From a Dietitian's Perspective, Diets for Irritable Bowel Syndrome Are Not One Size Fits All

Kate Scarlata, MPH, RDN,<sup>1</sup> Patsy Catsos, MS, RDN, LD,<sup>2</sup> and Janelle Smith, MS, RDN, CEDRD<sup>3</sup>

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Check for updates

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### Further Reading on this topic

Riehl M, Scarlata K. Understanding Disordered Eating Risks in Patients with Gastrointestinal Conditions. Journal of the Academy of Nutrition and Dietetics. 2021

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### Summary

- Diet for IBS is not one size fits all
- Goal as dietitian is to help manage symptoms with the most flexible and varied diet as possible.
- Disordered eating risks in the GI population are elevated and eating-disordered prevalence increasing: screen for these disorders.
- LFD can be validating and efficacious in the right patient.
  - Ideally utilize an RD with clinical experience and education in applying LFD
- Tolerance to foods can change over time—encourage patients to remain curious and to test tolerance over time.

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