


COMPLIMENTARY WEBINAR PRESENTATION | EARN 1 CEU FREE

Nuances to Applying the Low FODMAP Diet

PRESENTED BY
Kate Scarlata, MPH, RDN, LDN
Wednesday, May 27 at 2 PM EDT

This activity is accredited through Monash University.





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Disclosures

- Equity: Fody Food co., Epicured
- Honorarium/Consultant: A2 Milk Company, Enjoy Life Foods, Green Valley Creamery, Monash University, Salix pharmaceuticals
- Published books and online low FODMAP educational handouts

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 Fody Foods is a Monash Low FODMAP Certified Partner. Fody is dedicated to creating low FODMAP foods products so everyone can eat life to the fullest!

 MONASH UNIVERSITY LOW FODMAP CERTIFIED™

 the Monash University LOW FODMAP diet

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Learning Objectives

1

Detail factors involved with FODMAPs and GI symptom induction.


2

Describe the three phases of the low FODMAP diet.

3

List the criteria for selecting the best candidate for the low FODMAP diet.

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Allergy vs. Intolerance

Food allergy: immune-mediated reaction

Food intolerance: non-immune, enzymatic defects such as lactose intolerance; transport defects such as fructose; pharmacological such as effects of vasoactive amines; or undefined such as non-coeliac gluten or wheat sensitivity (NCG/WS)



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Food-Related Reactions: Allergy, Autoimmunity, and Intolerance

Food reaction	Pathogenesis	Clinical Entity	Symptoms
Allergy	IgE, non IgE, occasional IgE	Food allergy, F-PIES, EoE	Respiratory, GI, cardiovascular, skin, anaphylaxis
Autoimmune	Innate and adaptive immunity	Celiac disease (1% population)	GI symptoms, fatigue, low iron osteoporosis, B ₁₂ , folic acid, weight loss or gain, and more
Food intolerance	Disorder of digestive/absorptive process, toxic or pharmacologic reactions	Lactose intolerance, Sucrose-isomaltase deficiency, FODMAP, Histamine	GI Gas, bloat, constipation/diarrhea, pain Other Hives, low blood pressure, headaches, pain, diarrhea

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IBS: Rome IV Criteria

- **Recurrent abdominal pain**, on average, at least 1 day/week in the last 3 months, associated with two or more of the following criteria*:
 - Related to defecation.
 - Associated with a change in frequency of stool.
 - Associated with a change in form (appearance) of stool.
 - *Criterion fulfilled for the last 3 months with symptom onset at least 6 months prior to diagnosis.
- These symptoms occur **in the absence of any identifiable organic cause** (IBS is classified as a functional gastrointestinal disorder)
- In addition to abdominal pain and changes in bowel habit, many IBS patients report other symptoms such as **abdominal bloating and/or distension** and **increased flatulence**.

Meirin et al. Gastroenterology, May 2016

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IBS: Epidemiology

- IBS impacts about 11% of the population globally with a range from 10-25%
- Only 30% will consult with a physician about their sx
- Female predominance; 1.5 to 3-fold higher compared to men
- IBS occurs in all age groups, including children
- IBS is twice as high in individuals with biological relative with IBS



Clin Epidemiology 2014;6:71-80

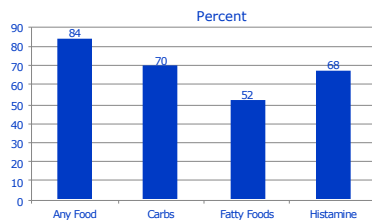
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Food and IBS Symptoms

- 197 IBS patients (Rome III)
- Symptom severity correlates with number of food sensitivities
- No impact of IBS subgroup



Bohn et al. Am J Gastroenterol 2013;108:634

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Food and GI Symptoms

Primary effects

- Osmotic
- Chemical
- Mechanical
- Neuroendocrine

Food

Secondary effects

- Fermentation byproducts
- Intraluminal pH
- Microbiome effects
- Bile Acids

IBS symptoms

Pain, bloating, altered bowel movements

Spencer M et al. *Curr Treat Opin Gastroenterol*. 2014.

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Food Intolerance

- Food intolerance syndromes and non-immune mediated intolerance contribute to GI and extra-intestinal symptoms
- Occurs in **15-20%** in Westernized countries

Carbohydrates
Lactose, fructose, FODMAP

Protein
Gluten, ATI, A1 β-casein

Biogenic amines
Histamine

ATIs, amylase trypsin inhibitors.
1. Ortolani C. *Best Pract Res Clin Gastroenterol*. 2005;20(3):467-83; 2. Lomer MWJ et al. *Alliment Pharmacol Ther*. 2015;41:261-276.

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RCTs: Evaluating the Low-FODMAP Diet for IBS

- 7 RCTs compared a low FODMAP diet with various controls in 397 participants
- A low FODMAP diet was associated with reduced overall symptoms compared to controls (RR 0.69; 95% CI 0.54, 0.88, I2 25%)
- The 3 RCTs that compared low FODMAP diet with rigorous control diets had the least heterogeneity between studies but also the least magnitude of effect
- The overall quality of the data was "very low" according to GRADE criteria
 - Most studies were high risk of bias
 - Heterogeneity between study designs
 - Imprecision in the estimate of effect


Dionne et al. *Am J Gastroenterol*. 2018;113(9):1290-1300.

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Beyond IBS: Low FODMAP for IBS-Like symptoms

- Endurance athlete with GI distress
- Celiac disease with IBS sx-overlap
- IBD with quiescent disease and IBS sx



Symptom Checker


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Sports-Related GI Distress

- 7% of triathletes report having abandoned a race because of GI complaints
- Upper GI symptoms (nausea, vomiting, GERD, and belching) more common in cycling sports compared with running
- Lower GI complaints common in runner (runner's trots)



de Oliveira EP, et al. Sports Med 2014; 44 (Suppl):S79-85.

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Food Avoidance in Athletes: FODMAPs on the List

- N=910 athletes (recreational -> Olympic medalists recruited)
- Assess self-selected foods to avoid to minimize GI distress via questionnaire
- GI distress described as: abdominal pain, bloating, cramping, flatulence, diarrhea
- 55% eliminated at least 1 high FODMAP food
- 82.6% reported symptom improvement
- In athletes indicating high FODMAP foods triggered symptom, lactose most frequently eliminated (86.5%), followed by GOS (23.9%), fructose (23%), fructans (6.2%) and polyols (5.4%)

Lis D, et al. Appl Physiol Nutr Metab 2016;41(9):1002-4

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LFD Athletes

- N=16 healthy volunteers crossover design manner to either a LOW FODMAP (16.06 ± 1.79 g·d⁻¹) or HIGH FODMAP (38.65 ± 6.66 g·d⁻¹) 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 condition from 81.1 ± 16.4 to 31.3 ± 9.2 (arbitrary units; P = 0.004)
- Perceived exercise frequency + intensity was significantly improved following a short-term LOWFODMAP approach compared to HIGH FODMAP

Wiffin et al. J Int Soc Sports Nutr. 2019;16(1):1. Published 2019 Jan 15.


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IBS/IBD Overlap

- 57% CD and 33% UC experience IBS-like symptoms
- IBD patients in remission with previous intestinal surgery, stenosis, or stomas are at risk of:
 - SIBO
 - Bile acid malabsorption
- Both have sx that mimic IBS



Tsai et al. J Clin Gastroenterol. 2018;52(12):1849-1854. doi:10.1097/MCG.0000000000000540.

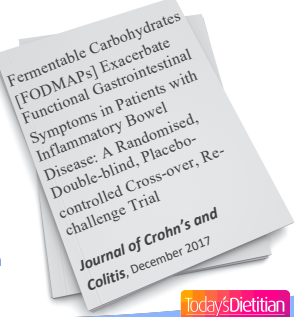
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Research

- Quiescent IBD with functional gut sx. (IBS, functional bloating, or functional diarrhea)
- N=32 (29 completed study)
- 3-day trial of challenges either:
 - 12 g/d fructan
 - 6 g/d sorbitol
 - 6 g/d GOS and 12 g/d glucose (placebo)
- Separated with 3-day washout period; symptoms and stool measure
- Fructans but not GOS or sorbitol exacerbated functional gut symptoms in quiescent IBD



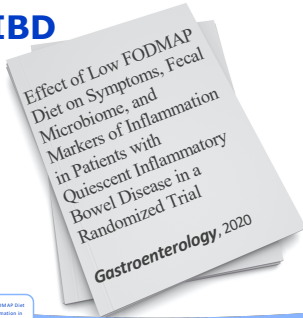
Das et al. Inflamm Bowel Dis. 2018;24(12):2815-2823. doi:10.1093/ibd/ibz015.

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LFD in IBD



Chu H, Lindvall JO, Fumagalli L, et al. Effect of Low FODMAP Diet on Symptoms, Fecal Microbiome, and Markers of Inflammation in Patients with Quiescent Inflammatory Bowel Disease in a Randomized Trial. *Gastroenterology*. 2020;158(12):376-386. doi:10.1053/j.gastro.2020.05.044

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LFD in IBD with IBS Symptoms

- N: 89 (75%) women, were randomized:
- 44 to LFD group and 45 to ND, from which **78 patients completed the study period** and were included in the final analysis (37 LFD and 41 ND)
- There was a significantly larger proportion of responders in the LFD group ($n = 30, 81\%$) than in the ND group ($n = 19, 46\%$); ($P < 0.01$)
- At week 6, the LFD group showed a significantly lower median IBS-SSS (symptom severity) and SIBDQ (QOL measure) than the ND group

Conclusion:

- In a prospective study, a low FODMAP diet reduced IBS-like symptoms and increased quality of life in patients with IBD in remission

Podman N et al. *World J Gastroenterol*. 2017;23(18):3356-3365.


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Celiac Disease and IBS/SIBO Overlap


- Meta-analysis in Celiac Disease (CD) shows up to 38% have overlap IBS sx
- SIBO symptom profile mimics that of IBS
- Systematic review looking for prevalence of SIBO in CD:
 - Eleven articles fulfilled considered criteria. The pooled mean prevalence of SIBO in CD was 20% (95% CI of 10%-30%).
 - LFD in SIBO not formally studied. But, majority of those with SIBO fit criteria for IBS.
 - LFD may offer symptom relief in this population.

Sainsbury A et al. *Clin Gastroenterol Hepatol*. 2021;19:269-282. Looney G et al. *Gastroenterology*. 2017;151:2969.

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FODMAP: The Acronym



Fermentable
Oligosaccharides (fructans and GOS)
Disaccharides (lactose, milk sugar)
Monosaccharides (excess fructose)
And
Polyols (sugar alcohols, such as mannitol and sorbitol)

GOS, galacto-oligosaccharides.

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Who's Appropriate 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

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Flexible Approach to LFD: "FODMAP Gentle"

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

Food Group	Restrict only
Grains	Wheat and Rye
Vegetables	Onion, leek, garlic, cauliflower, most mushrooms
Fruit	Apple, pear, watermelon, larger quantities dried fruit
Dairy	Milk and traditional yogurt
Legumes	Beans not allowed on elimination LFD

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

Adapted from Melissa S. Gibson, P. Camilleri and coauthors and courtesy of the FODMAP diet TV

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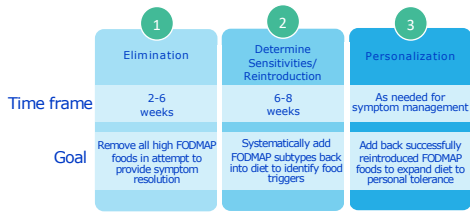
Full LFD and "FODMAP Gentle" Approach: Potential Contraindications

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	Nonadherence	Alternative IBS therapies or FODMAP gentle
Poor capacity to follow diet (does not prepare own food/food insecurity)	Nonadherence	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 Holmes S, Gibson P. Contraindications and reality of the FODMAP diet for patients with irritable bowel syndrome. *Gut*. March 2019.

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Low FODMAP: Three Phases

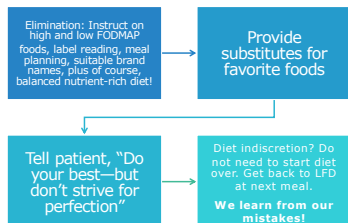


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Low FODMAP: Elimination Phase




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Meal Planning Can Be Made Easier

- Epicured and Modify health:
 - Low FODMAP —meal delivery nationwide
- Certified low FODMAP foods to sub in favorites
 - FODY foods bars, ketchup, salsa, seasonings, soup base
 - Green Valley kefir and yogurt (certain flavors), cottage cheese, sour cream: all lactose free; FF certified
 - Enjoy life foods has a number of LFD certified and allergy friendly options
 - Schar has some LFD products, too



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When Food is Confusing: *The Soy Example*


High FODMAP

- Soy flour, whole mature soybeans, silken tofu

Low FODMAP

- Edamame (1 cup), firm tofu, soy milk made with soy protein (8th Continent ®), soy sauce, soy lecithin




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The Reintroduction Phase: *Basic Guidelines*

- Test one FODMAP group (lactose, excess fructose, etc.) at a time and choose foods that contain only one FODMAP
- Consume a food amount that represents a normal intake (not excessive amounts)
- Continue to restrict 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 the same food for each of the 3 challenge days

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Determine Sensitivities with the Following Foods

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

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What is a Failed Challenge?

- A failed challenge should be a noticeable and significant change in symptoms
- Symptoms may resemble an IBS flare: diarrhea, cramping, return of constipation, bloating
- = Undesirable outcome

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Why Reintroduce FODMAPS?

- Research has shown that the low FODMAP diet reduces bifidobacteria and other probiotic gut bacteria (butyrate-producing Clostridium cluster XIVa and mucus-associated Akkermansia muciniphila)
- Stool pH increases slightly on the low FODMAP diet---this may allow pathogenic microbes to grow
- The low FODMAP has been shown in 2 studies to increase gut microbial diversity---perhaps a good thing!

Hallinan, Gut 2015
McIntosh, Gut 2018

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Non-Responder

Assess symptoms:

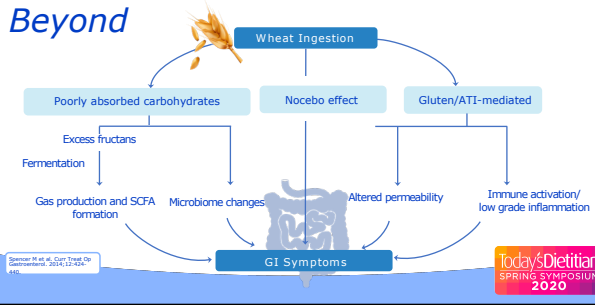
- Bloating and post prandial fullness: r/o SIBO, gastroparesis
- Constipation: assess for slow transit constipation and/or dyssynergic defecation, high colonic stool burden, methane + SIBO
- Diarrhea: parasitic infection, bile acid malabsorption, SIBO
- Other food intolerance/sensitivities: gluten, fat, sucrose, food chemicals-histamine, milk protein (A1 vs A2)
- Consider probiotics, gut-directed hypnotherapy + other gut-brain directed therapies

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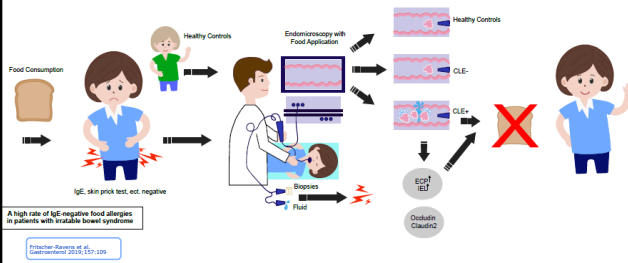
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Wheat Intolerance: FODMAPs and Beyond



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Might IBS Patients Have Atypical, Non-IgE Mediated Food Allergies?



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Might IBS Patients Have Atypical, Non-IgE Mediated Food Allergies?

Prevalence of atopic disorders or family history of atopic disorders

Group	Percentage (%)
CLE+	~70
CLE-	~40
HC	~20

CLE before and after exposure to wheat, milk, soy, yeast, or egg white, and a control (simethicone)

76/108 pts CLE + (70%)

- 46 (61%) reacted to wheat
- 4-fold higher rate of atopic conditions
- More IELs than controls
- Expression of claudin-2 up regulated and increased from crypt to villus tip (P < .001)
- Levels of Occludin were reduced
- No differences in inflammatory cytokines or eosinophils but degranulating eosinophils increased

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Amylase Trypsin Inhibitors (ATIs)

Activate innate immunity and may fuel gut inflammation^{1,2}

ATIs

- Pest-resistance molecules in wheat¹
- Family of 17 proteins constituting 4% of total wheat protein¹
- Highly resistant to intestinal proteases and heat¹

Associated with non-celiac wheat intolerance^{2,1,2}

Modern gluten-containing staples (hybridized wheat) have levels of ATIs 100-fold higher than gluten free food³

- Older wheat variants (Emmer, Einkorn) have lower ATI bioactivity
- GF grains lowest ATIs

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LFD and the Metabolome

- N=37 IBS (19 LFD; 18 HFD) x 3-week diet
- LFD increased bacterial richness
- Metabolic profiling of urine differed after the diet (p<0.01), with 3 metabolites (histamine, p-hydroxybenzoic acid, azelaic acid)
- Histamine, a measure of immune activation, **was reduced eightfold** in the LFD group (p<0.05) and increased in the HFD group in subsets of patients
- Histamine is known to be elevated in the intestinal tissues of IBS patients and can sensitize pain-sensing nerves. Several studies suggest that blocking histamine signaling decreases pain sensations in a subset of IBS patients. Lowering FODMAPs in the diet appears to be another means of decreasing histamine signaling
- P-Hydroxybenzoic and azelaic acid increased on LFD—associated with potential anti-inflammatory effects

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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.	Trial and error regimens to identify food triggers.

Sutherland et al, Appetite, 2015, 84:240-50

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Avoidant/Restrictive Food Intake Disorder (ARFID)

- Introduced in the DSM-5 as a diagnosis of eating or feeding disturbance due to lack of interest in eating, avoidance of sensory characteristics of food, and/or **fear of adverse eating consequence** (eg, choking, vomiting, or digestive distress)
- To meet diagnostic criteria, one doesn't have a distorted body image and the food disturbance must lead to one or more of the following:
 - nutritional deficiency
 - weight loss
 - psychosocial impairment, or
 - dependence on oral nutritional supplements or tube feedings
- ARFID can't be diagnosed if the eating disturbance is attributable to a concurrent medical or psychiatric condition.**

American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders (DSM-5). USA: American Psychiatric Association; 2013.

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ARFID + GI

- Preliminary research by Zia and colleagues found that approximately 21% of their functional gastrointestinal disorder (FGID) patient sample met criteria for ARFID
- Retrospective study of GI patients referred to GI behavioral health providers from the University of Michigan found 12.6% of the cohort met criteria for ARFID
- Interpret with caution as we don't want to be too quick to assign an eating disorder to GI patients given the individuality of one's sensitive gut to potential food triggers and associated behaviors
- ARFID and other ED screening tools **not validated in IBS**

Zia, M, et al. Disordered Eating in Patients with Functional Gastrointestinal Disorders. *Journal of Clinical Gastroenterology*. 2019;53(10):1753-1758.


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Monash FODMAP Resources: *Monash FODMAP Diet App*

- The Monash FODMAP App contains the world's largest FODMAP food database
- Uses a simple traffic light system to classify foods as low (green), moderate (amber) or high (red) in FODMAPs at a particular serving size
- Contains detailed tutorials and resources to assist patients to follow all 3 steps of the diet and find a local FODMAP Trained dietitian




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Monash FODMAP Resources: *Online Courses for IBS Patients*

- Comprehensive online training in IBS and the FODMAP diet for patients (ideal for patients unable to access a dietitian)
- Consists of 5 modules covering:
 1. What IBS is and how it is diagnosed
 2. Introduction to FODMAPs and the FODMAP diet
 3. How to implement a low FODMAP diet (step 1)
 4. How to reintroduce FODMAPs (step 2)
 5. How to personalize your FODMAP diet (step 3), including alternative therapies if a FODMAP diet doesn't work for you



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Monash FODMAP Resources: *Online Training for Dietitians*


Comprehensive online training in IBS and the FODMAP diet for dietitians

Consists of 10 modules covering:


- The pathophysiology of IBS
- The FODMAP content of foods
- Implementing a 3 step FODMAP diet in practice
- Troubleshooting when the diet doesn't work
- Adjunct therapies for IBS
- Using the FODMAP diet in other groups e.g. pediatrics and endometriosis

Benefits of the course:

- ✓ Learn directly from the pioneers of FODMAP research
- ✓ Earn **30 CPEUs** (pre-approved by the CDR)
- ✓ List your practice details on the Monash University FODMAP Diet app and website



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Questions?
Kate Scarlata, MPH, RDW

www.katescarlata.com
f KateScarlataRD
t @katescarlata_RD
e kate@katescarlata.com



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