

# Dietary therapies in IBS: Where we are now and where do we go from here

Prashant Singh

Assistant Professor, Division of Gastroenterology  
University of Michigan



# Learning Objectives

- Determine the who, when, how, and why when using the Low FODMAP diet in IBS.
- Other dietary therapies in IBS (old and new).
- The use of fiber and functional foods in IBS

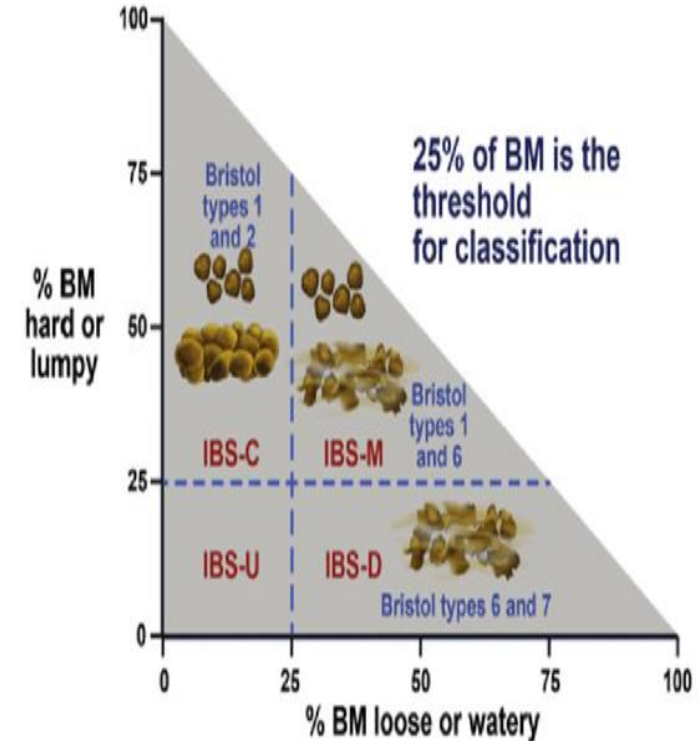


# IBS definition

## Rome IV Criteria for IBS

Recurrent abdominal pain  
at least 1 day/ week meeting 2/3 criteria

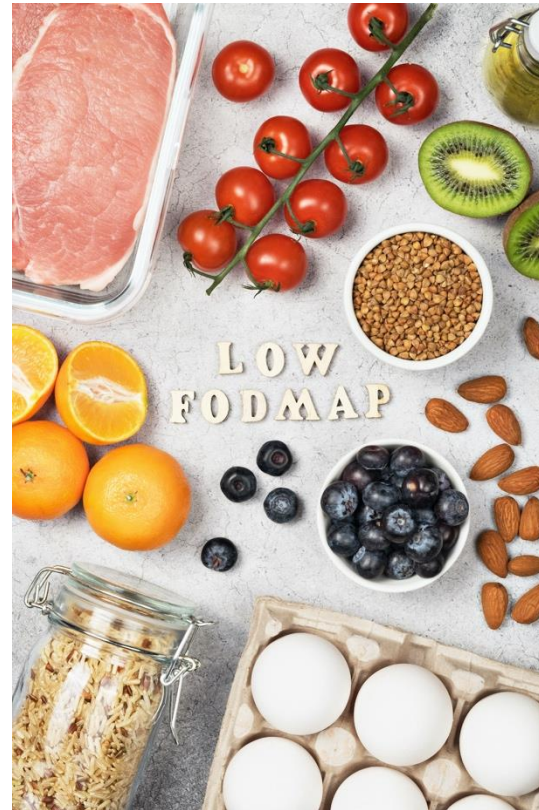
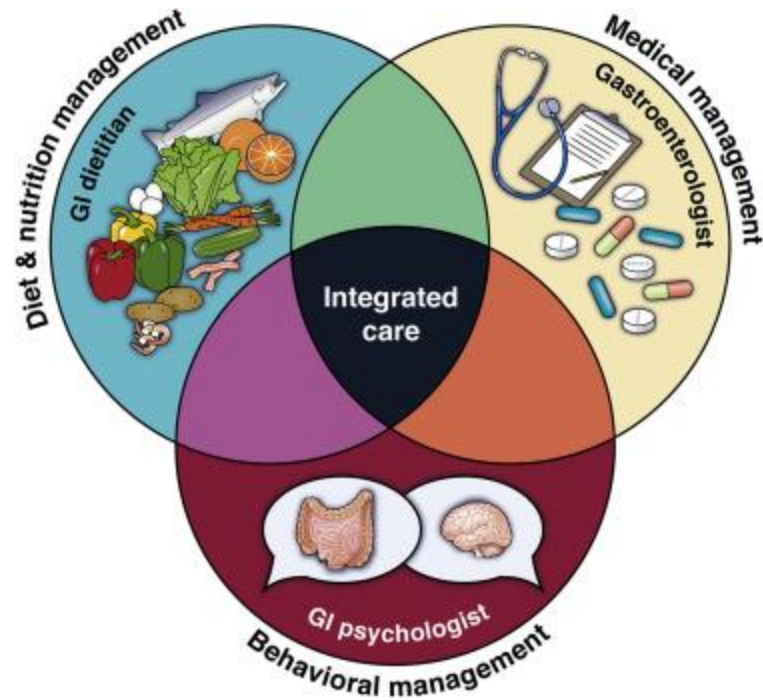
1. Related to defecation
2. Associated with a change in stool frequency
3. Associated with a change in stool consistency



\*Criteria fulfilled for the last 3 months with symptom onset  
at least 6 months prior to diagnosis



# Therapies for IBS



**NICE** National Institute for Health and Care Excellence

Search NICE...

Guidance ▾ Standards and indicators ▾ Life sciences ▾ British National Formulary (BNF) ▾ British National Formulary for Children (BNFC) ▾ Clinical Knowledge Summaries (CKS) ▾ About ▾

[Home](#) > [NICE Guidance](#) > [Conditions and diseases](#) > [Digestive tract conditions](#) > [Irritable bowel syndrome](#)

## Irritable bowel syndrome in adults: diagnosis and management

Clinical guideline [CG61] Published: 23 February 2008 Last updated: 04 April 2017

# PHASE 1

## Reduce total FODMAP intake

Dietitian review

- Reduce FODMAP intake
- 2-8 weeks
- Replace with suitable low FODMAP alternatives from the same food group

If no response occurs return to usual diet and trial alternate treatment

# PHASE 2

## Re-challenge to assess tolerance

Dietitian review

Individual re-challenge of each FODMAP subgroup:

- Fructan e.g. wheat, onion
- GOS e.g. legumes/pulses
- Lactose e.g. milk
- Excess fructose e.g. Honey
- Polyols e.g. avocado

Challenge over 2-3 days and monitor symptom response. Order of challenges based on nutritional need and patient preferences.

# PHASE 3

## Long term maintenance

Dietitian review

Individualised diet based on response to food challenges:

- Tolerated foods – reintroduce freely
  - Foods causing mild/moderate symptoms – reintroduce when able
  - Foods causing severe symptoms – avoid
- Continue to challenge poorly tolerated foods in the long-term



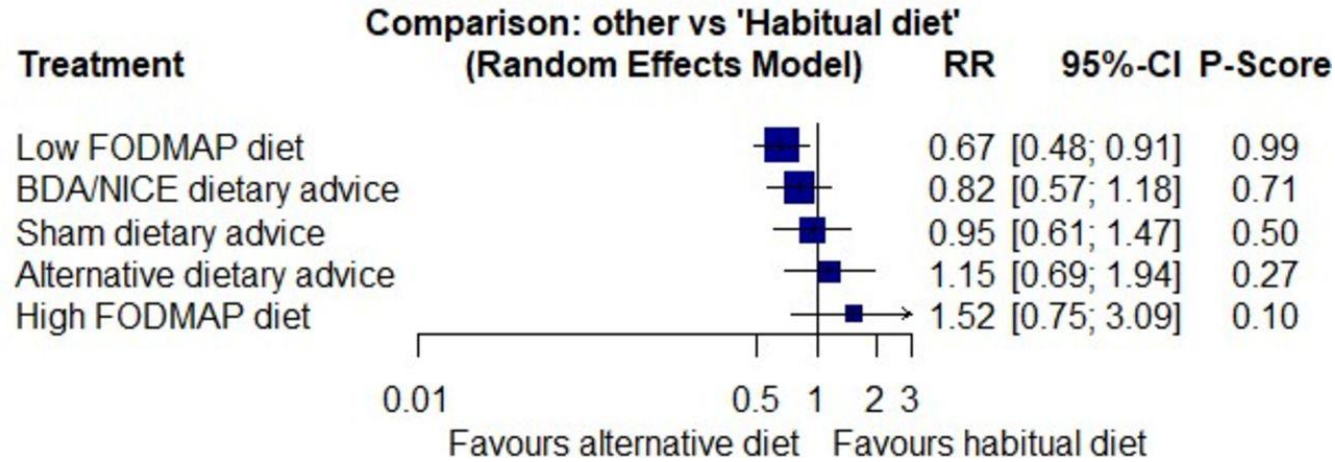
# Learning Objectives

- Why use it?
- When to use it (and when not to)
- How to use it?
- How does it work?
- Who should we use it in?





# Efficacy of LFD in IBS: A network meta-analysis



## Low FODMAP diet

|                     |                         |                     |                     |                            |                  |
|---------------------|-------------------------|---------------------|---------------------|----------------------------|------------------|
| 0.81 (0.67 to 0.97) | BDA/NICE dietary advice |                     |                     |                            |                  |
| 0.70 (0.52 to 0.95) | 0.87 (0.61 to 1.23)     | Sham dietary advice |                     |                            |                  |
| 0.67 (0.48 to 0.91) | 0.82 (0.57 to 1.18)     | 0.95 (0.61 to 1.47) | Habitual diet       |                            |                  |
| 0.58 (0.38 to 0.87) | 0.71 (0.45 to 1.12)     | 0.82 (0.49 to 1.37) | 0.87 (0.52 to 1.46) | Alternative dietary advice |                  |
| 0.44 (0.23; 0.83)   | 0.54 (0.28 to 1.05)     | 0.62 (0.31 to 1.26) | 0.66 (0.32 to 1.34) | 0.76 (0.36 to 1.62)        | High FODMAP diet |

# Efficacy of LFD IBS: A network meta-analysis (contd.)

**Table 3** Summary treatment effects from the network meta-analysis for failure to achieve an improvement in abdominal pain severity

|                        |                                   |                                |                      |                            |                         |
|------------------------|-----------------------------------|--------------------------------|----------------------|----------------------------|-------------------------|
| <b>Low FODMAP diet</b> |                                   |                                |                      |                            |                         |
| 0.79 (0.39 to 1.59)    | <b>Alternative dietary advice</b> |                                |                      |                            |                         |
| 0.78 (0.57 to 1.06)    | 0.98 (0.46 to 2.11)               | <b>BDA/NICE dietary advice</b> |                      |                            |                         |
| 0.72 (0.47 to 1.10)    | 0.91 (0.40 to 2.06)               | 0.92 (0.54 to 1.57)            | <b>Habitual diet</b> |                            |                         |
| 0.51 (0.30 to 0.87)    | 0.65 (0.27 to 1.56)               | 0.66 (0.35 to 1.22)            | 0.71 (0.36 to 1.41)  | <b>Sham dietary advice</b> |                         |
| 0.47 (0.20 to 1.07)    | 0.59 (0.20 to 1.74)               | 0.60 (0.25 to 1.45)            | 0.65 (0.26 to 1.65)  | 0.91 (0.34 to 2.44)        | <b>High FODMAP diet</b> |

Relative risk with 95% CIs in parentheses. Comparisons, column versus row, should be read from left to right and are ordered relative to their overall efficacy. The intervention in the top left position is ranked as best after the network meta-analysis of direct and indirect effects. Boxes shaded green denote a statistically significant difference. BDA/NICE, British Dietetic Association/National Institute for Health and Care Excellence; FODMAP, fermentable oligosaccharides, disaccharides, monosaccharides, and polyols.

**Table 4** Summary treatment effects from the network meta-analysis for failure to achieve an improvement in abdominal bloating or distension severity

|                        |                                   |                            |                         |                                |                      |
|------------------------|-----------------------------------|----------------------------|-------------------------|--------------------------------|----------------------|
| <b>Low FODMAP diet</b> |                                   |                            |                         |                                |                      |
| 0.95 (0.50 to 1.79)    | <b>Alternative dietary advice</b> |                            |                         |                                |                      |
| 0.85 (0.51 to 1.43)    | 0.90 (0.40 to 2.05)               | <b>Sham dietary advice</b> |                         |                                |                      |
| 0.69 (0.36 to 1.32)    | 0.73 (0.29 to 1.81)               | 0.81 (0.35 to 1.86)        | <b>High FODMAP diet</b> |                                |                      |
| 0.72 (0.55 to 0.94)    | 0.76 (0.38 to 1.52)               | 0.84 (0.47 to 1.52)        | 1.05 (0.51 to 2.13)     | <b>BDA/NICE dietary advice</b> |                      |
| 0.71 (0.47 to 1.06)    | 0.75 (0.35 to 1.59)               | 0.83 (0.43 to 1.60)        | 1.03 (0.48 to 2.22)     | 0.98 (0.61 to 1.60)            | <b>Habitual diet</b> |

Relative risk with 95% CIs in parentheses. Comparisons, column versus row, should be read from left to right and are ordered relative to their overall efficacy. The intervention in the top left position is ranked as best after the network meta-analysis of direct and indirect effects. Boxes shaded green denote a statistically significant difference. BDA/NICE, British Dietetic Association/National Institute for Health and Care Excellence; FODMAP, fermentable oligosaccharides, disaccharides, monosaccharides, and polyols.

- LFD ranked first for abdominal pain severity, abdominal bloating severity, and bowel habit
- The magnitude of improvement greatest for abdominal pain
- No difference in efficacy among various IBS subtypes





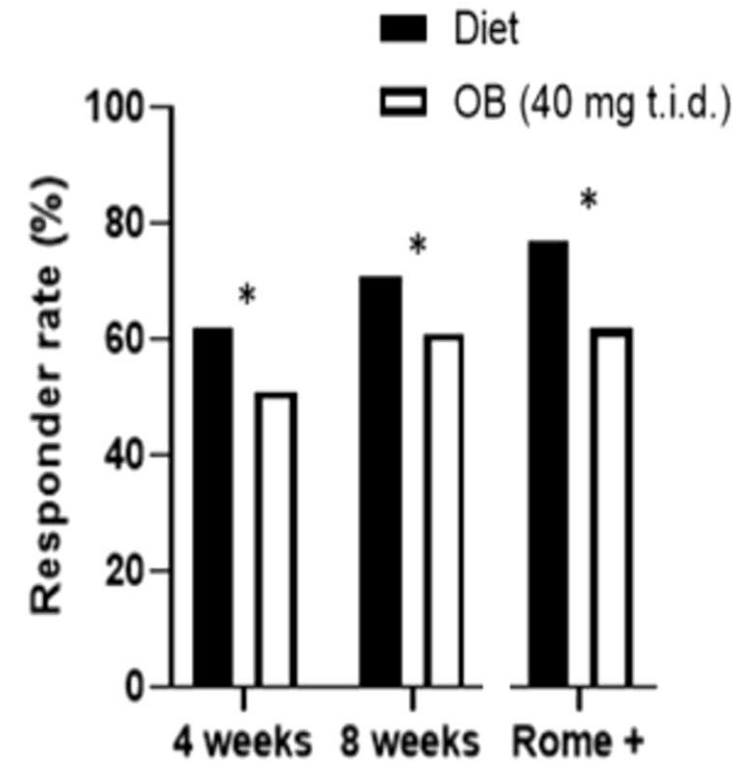
# Learning Objectives

- Why use it?
- When to use it (and when not to)
- How to use it?
- How does it work?
- Who should we use it in?



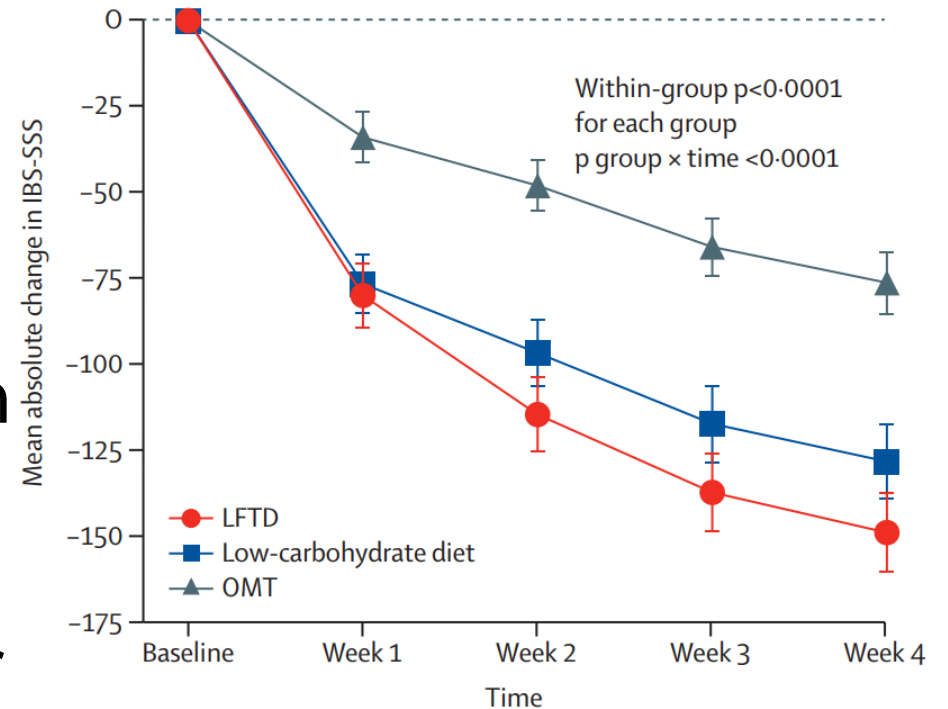
# LFD as first-line therapy in IBS?

- 459 primary care IBS patients randomized to Otilonium bromide vs. LFD
- A 50-point decrease in IBS-SSS as a response
- The significantly higher response rate with diet after 4 and 8 weeks.
- In primary care IBS patients, LFD was superior to a spasmolytic agent in improving IBS symptoms.



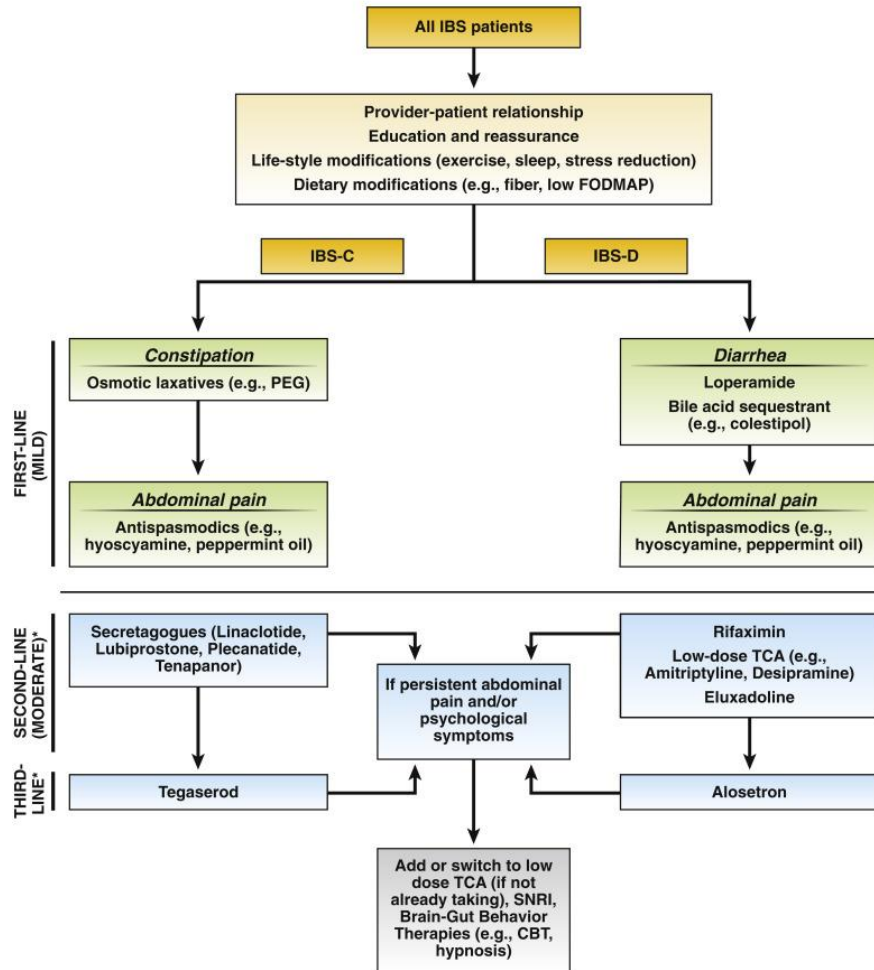
# LFD as first-line therapy in IBS?

- Single center, single-blind, RCT
- N=304
- Primary outcome = 50-point IBS-SSS reduction
- LFD and low carbohydrate diet better than optimized medical therapy (76% vs. 71% vs. 58% respectively,  $p=0.023$ ).
- LFD could be used as first-line therapy for IBS



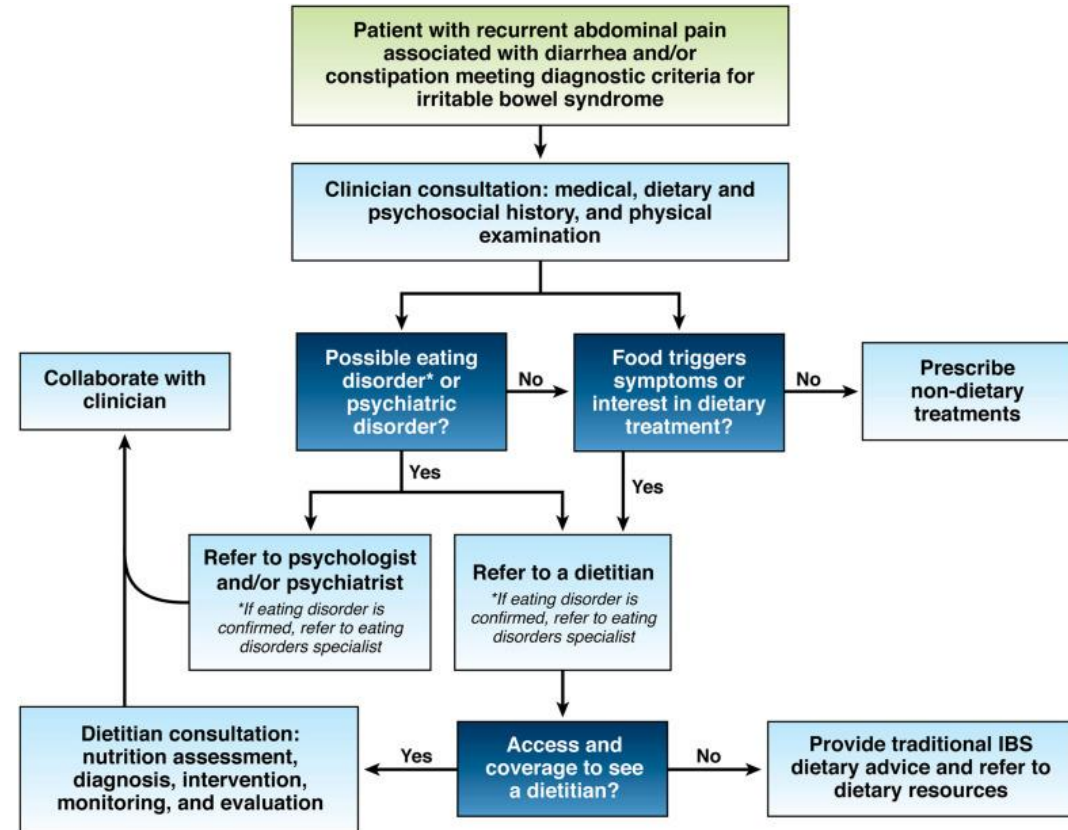
# When to use LFD?

## Clinical Decision Support Tool: IBS Treatment



\*Selection of the medication should be based on the clinical features and needs of the patient.

TCA, tricyclic antidepressant; SNRI, serotonin-norepinephrine reuptake inhibitor; PEG, polyethylene glycol; CBT, cognitive behavioral therapy

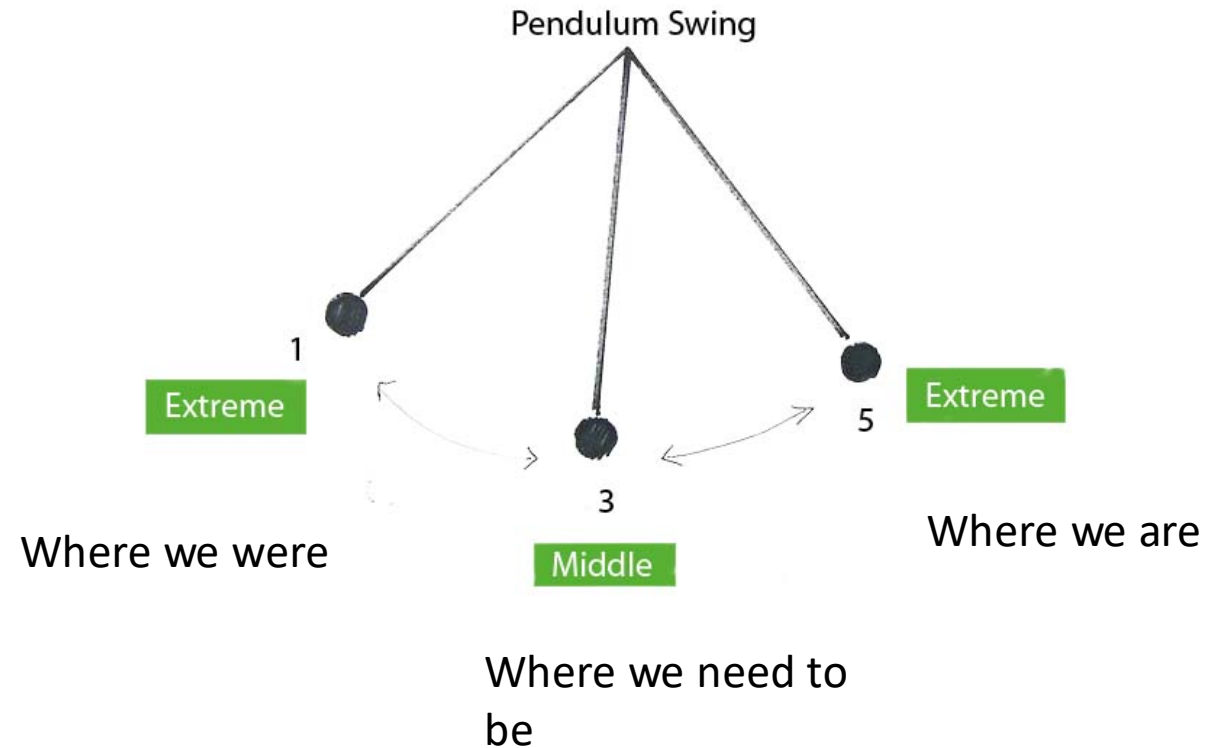


Chang et al, Gastro 2022  
 Lembo et al, Gastro, 2022  
 Chey et al, Gastro 2022



# When not to use LFD

- Eating disorders including ARFID
- Already restricted diet
- Patient preference
- Cost
- Use with caution when constipation/diarrhea are the main complaint (Functional constipation, functional diarrhea)



# What's ARFID

- ARFID differs from other EDs in that it does *not* involve concerns about body shape or weight
- ARFID is defined as dietary restriction (reduced overall food intake and/or dietary variety) that results in one or more
  - Nutritional deficiency,
  - Significant weight loss/inability to gain weight
  - Dependence on supplemental nutrition
  - Impairment in psychosocial functioning.





# ARFID contd.

- 20-25% of patients with DGBI likely have ARFID (can be up to 40%)
- Gastroenterologists must screen our patients for ARFID before introducing elimination diets
- Often open-ended questions are helpful
  - ✓ How is your relationship with meals
  - ✓ How is your appetite in general
  - ✓ How is your weight doing
  - ✓ Things they like/avoid to eat
- More specific questionnaires like SCOFF, NIAS, EDE-Q but their sensitivity and specificity in diagnosing ARFID in DGBI is not clear.

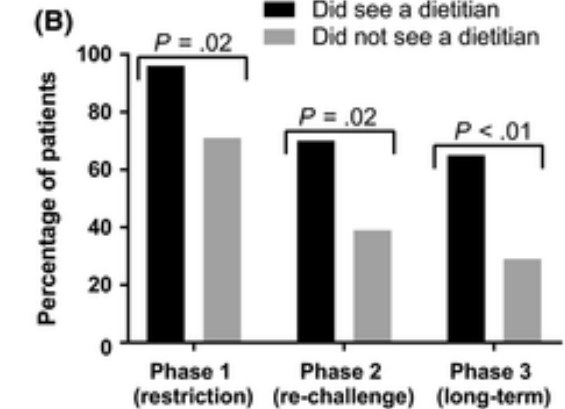
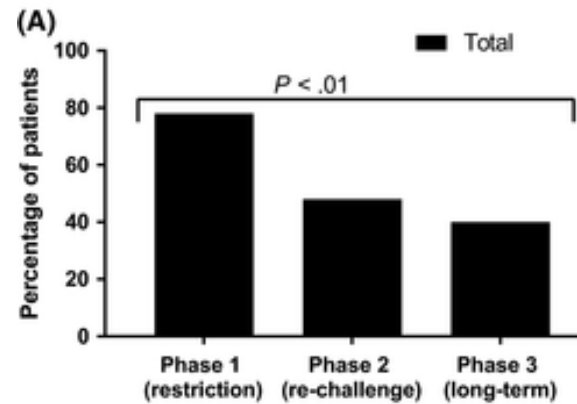
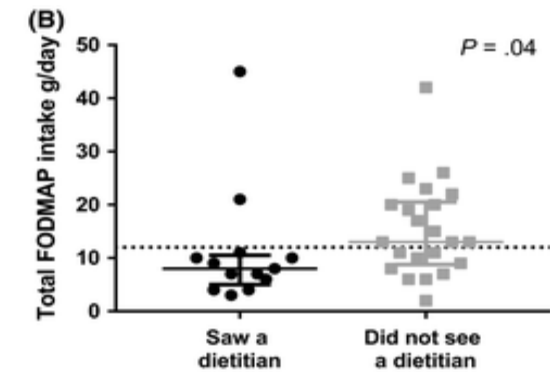
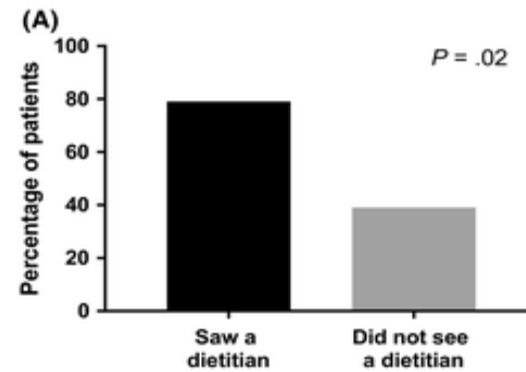
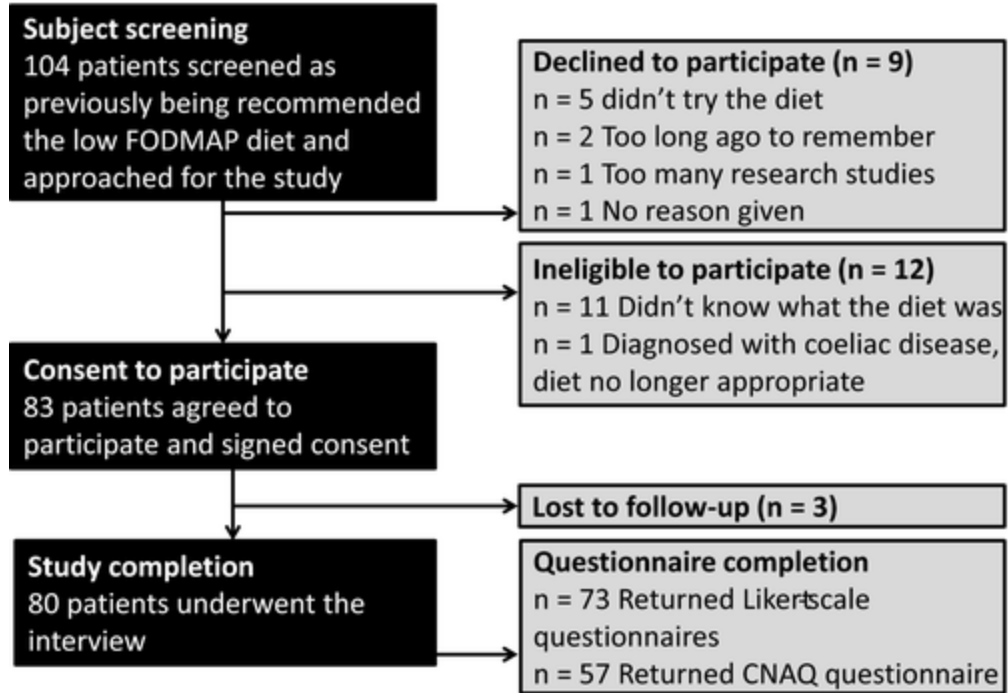


# Learning Objectives

- Why use it?
- When to use it (and when not to)
- **How to use it?**
- How does it work?
- Who should we use it in?



# How to use LFD? (With a dietitian)



# Patient experience with LFD

Figure 1

Figure 1a.

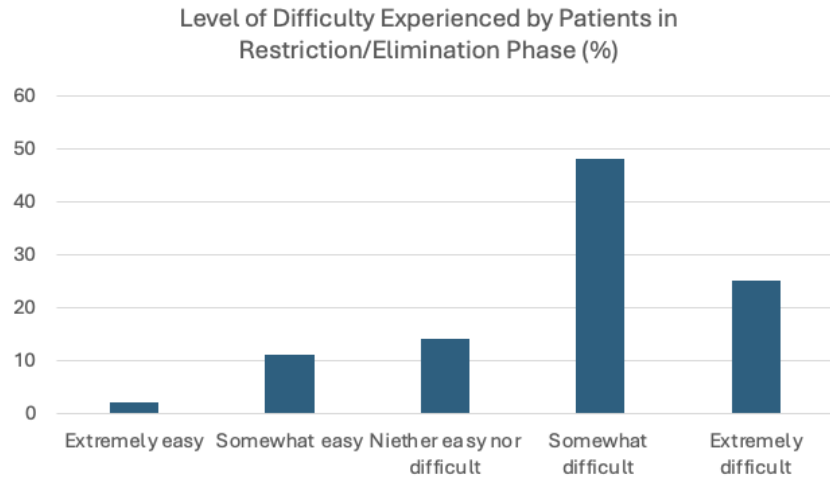


Figure 1c.

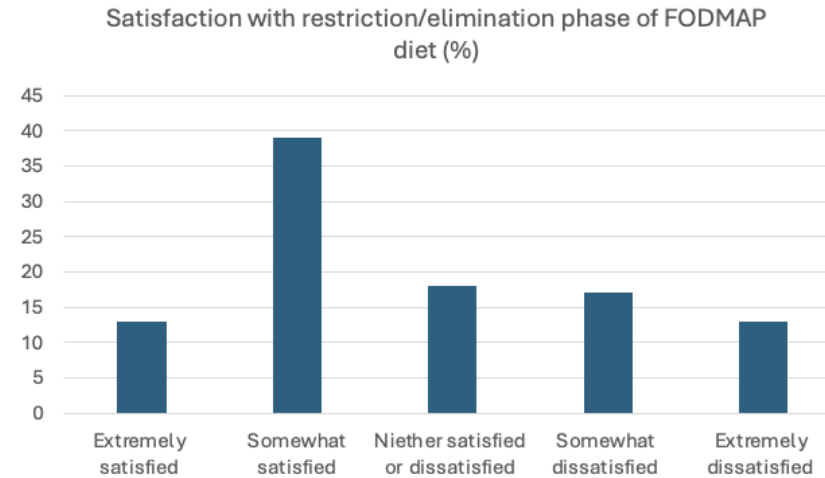


Figure 1b.

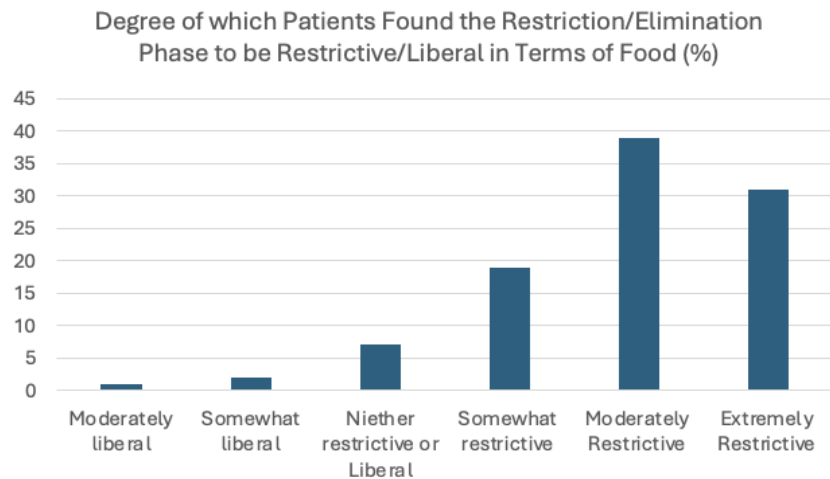
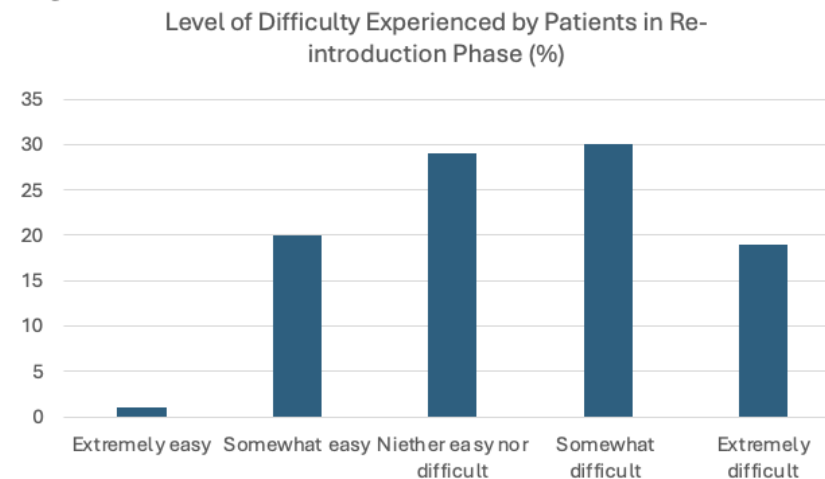


Figure 1d.



# Patient experience with LFD

**Table 1**

| Number of patients  | 8 weeks or less                     | 8-12 weeks                    | 13-16 weeks                    | 17-20 weeks                       | > 20 weeks |
|---|-------------------------------------|-------------------------------|--------------------------------|-----------------------------------|------------|
| Time spent on the restriction/elimination phase of low FODMAP diet                                    | 32 (38%)                            | 20 (24%)                      | 7 (8%)                         | 7 (8%)                            | 18 (21%)   |
| Time spent to complete re-introduction phase of low FODMAP diet                                       | 22 (33%)                            | 17 (25%)                      | 10 (15%)                       | 4 (6%)                            | 14 (21%)   |
|   | <b>Yes</b>                          |                               | <b>No</b>                      |                                   |            |
| Patients answering yes/no regarding if they are still in the personalization phase of the FODMAP diet | 40 (53%)                            |                               | 35 (47%)                       |                                   |            |
|   | <b>3 food items or less avoided</b> | <b>4-5 food items avoided</b> | <b>6-10 food items avoided</b> | <b>&gt; 10 food items avoided</b> |            |
| Patients avoiding high FODMAP items in the personalization/maintenance phase                          | 1 (3%)                              | 9 (23%)                       | 11 (28%)                       | 19 (48%)                          |            |

# Cons of LFD

- Restrictive
- Cumbersome
- Time-consuming
- Costly
- Potential risk of continuing the elimination phase long-term
- Risk of micronutrient deficiencies





# Identifying the most culprit FODMAP subgroups

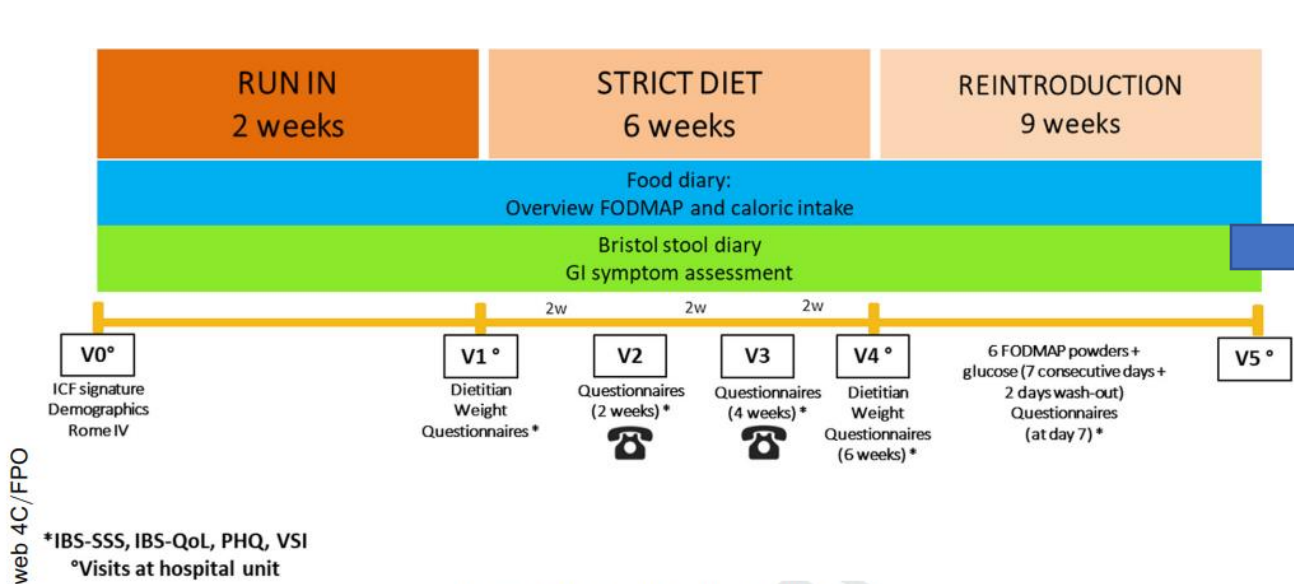
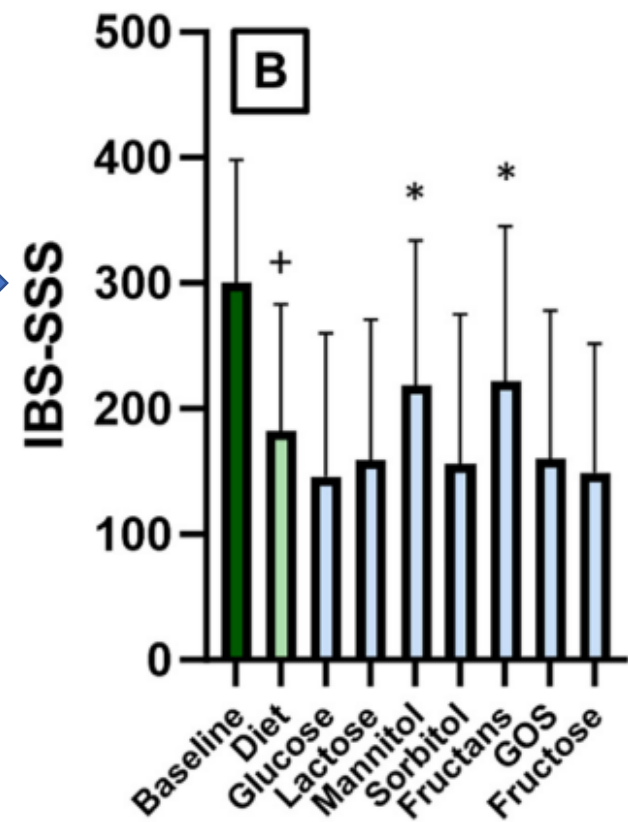


Figure 1. Trial design. GI, gastrointestinal.

| Randomized blinded order |     |
|--------------------------|-----|
| Fructans                 | 20g |
| Fructose                 | 60g |
| GOS                      | 12g |
| Lactose                  | 60g |
| Mannitol                 | 15g |
| Sorbitol                 | 15g |
| Glucose                  | 30g |



# Not all FODMAPs are equal



## Double-blind Food Challenge

5 sequences over 7 days; 7-day washout

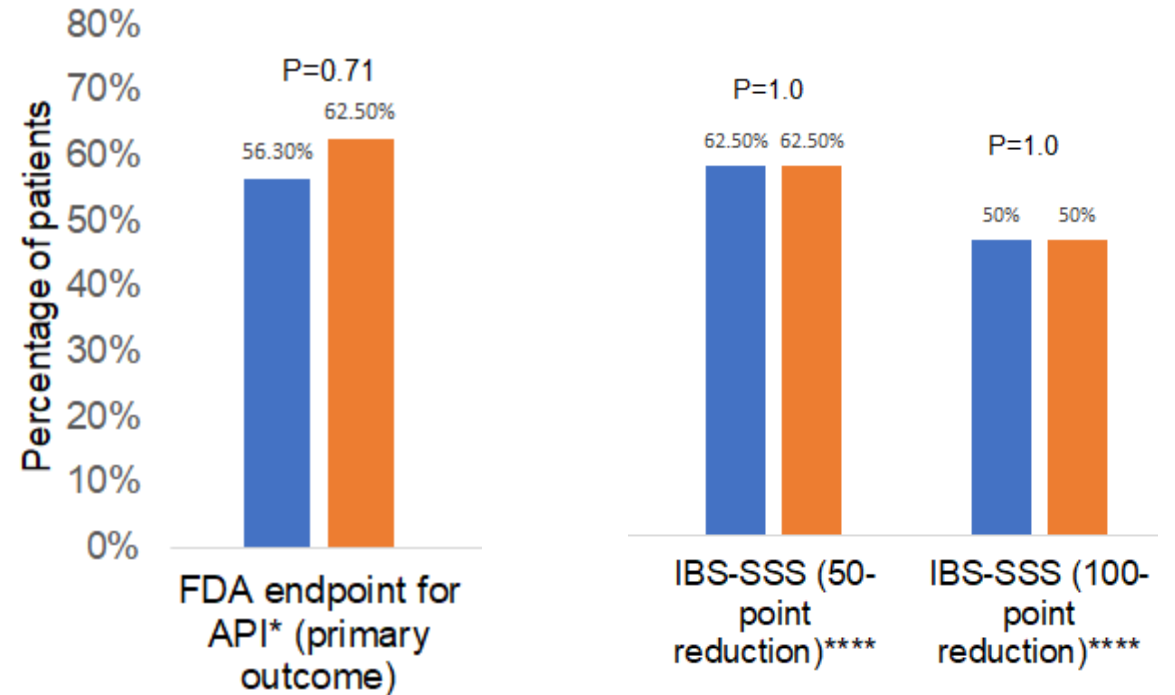
| Challenge | 3-day Moderate dose | 4-day high dose |
|-----------|---------------------|-----------------|
| Fructans  | 0.75g               | 1.5g            |
| Fructose  | 10g                 | 21g             |
| GOS       | 2g                  | 4g              |
| Lactose   | 10g                 | 20g             |
| Sorbitol  | 5g                  | 10g             |

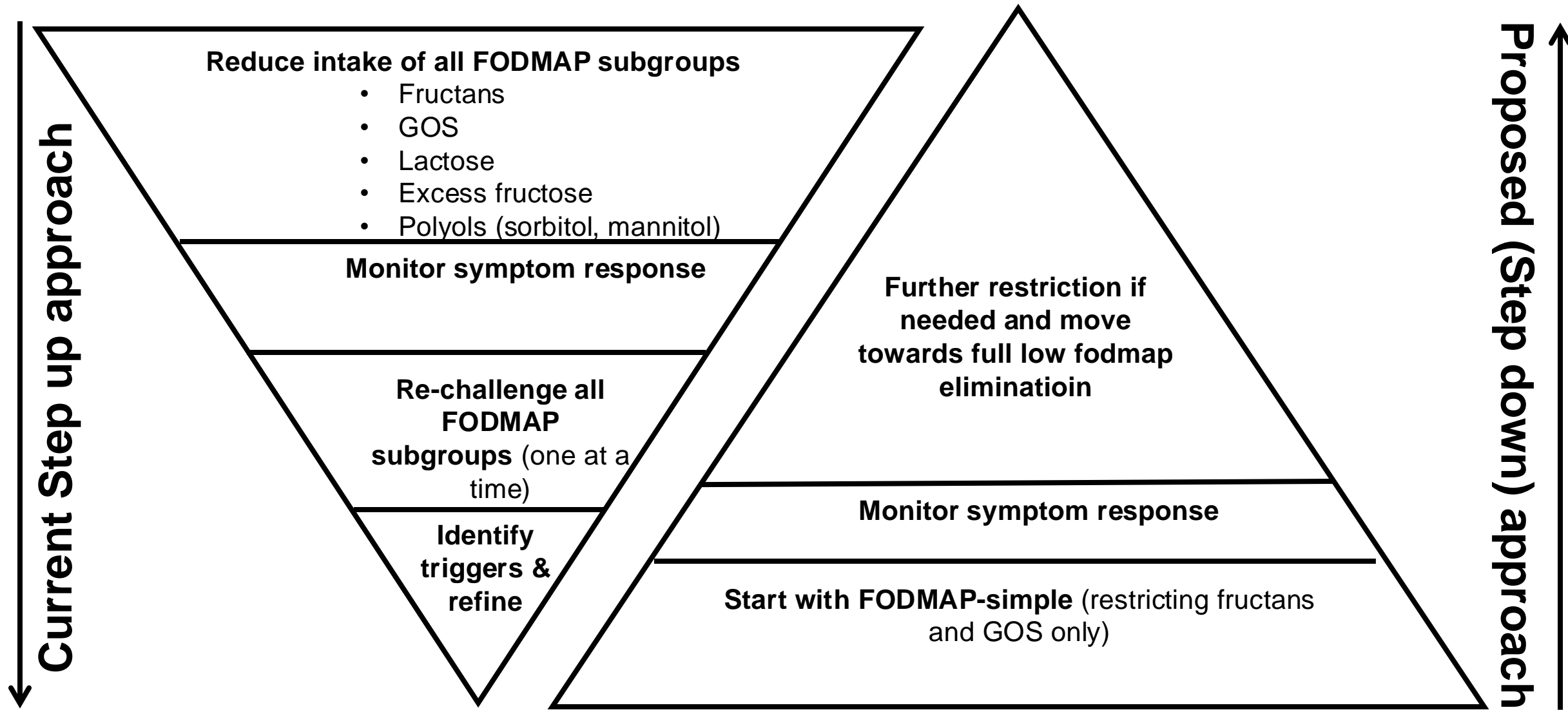
- Abdominal pain was significantly worse after fructans. ( $P=0.007$ )
- In analyses restricted to the first reintroduction period, the fructan ( $P=.03$ ) and galactan ( $P=.04$ ) challenges were significantly associated with abdominal pain.
- In analyses restricted to first reintroduction challenge, galactan ( $P=.03$ ) was significantly associated with bloating.



# Simplified version of low fodmap restriction is feasible and effective

- Pilot, feasibility trial comparing FODMAP-simple (eliminating fructans and galacto-oligosaccharides) vs. traditional LFD in IBS-D
- FODMAP-simple improves symptoms in a majority of patients with IBS-D.
- FODMAP-simple is better tolerated than traditional LFD (AE rate 12.5% vs. 26.3%)





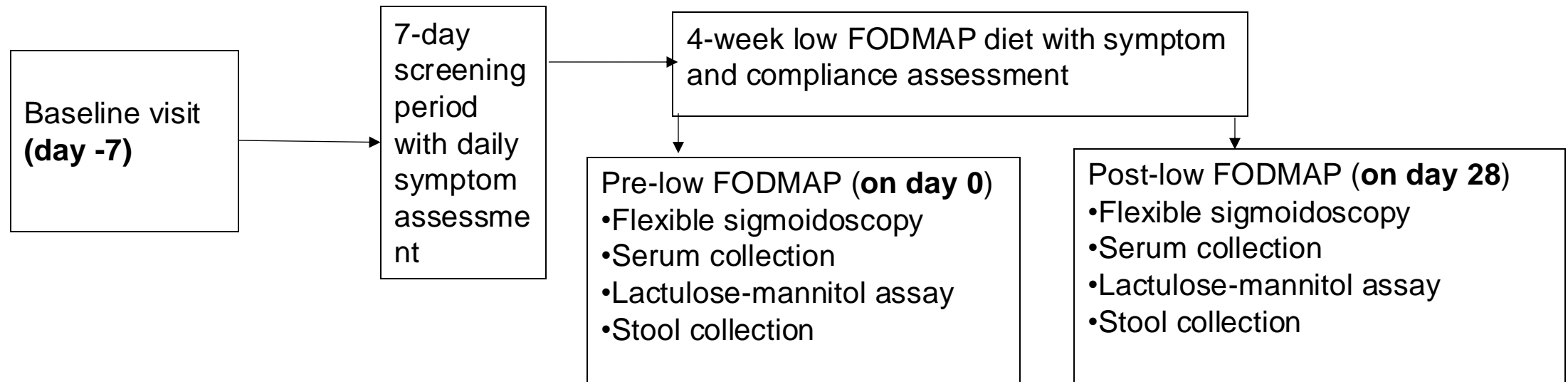
# Learning Objectives

- Why use it?
- When to use it (and when not to)
- How to use it?
- **How does it work?**
- Who should we use it in?



# Aim: Delineate the effect of LFM on colonic epithelial barrier function and mast cell activation in IBS-D

Hypothesis: LFM improves colonic epithelial barrier function and decreases mast cell activation in IBS-D patients with response to LFM





# 4-week LFM improves symptoms in majority of IBS-D patients



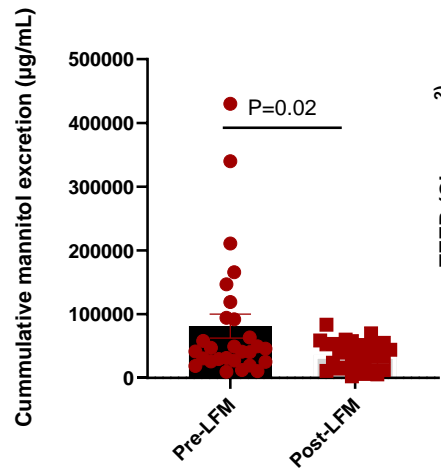
Response= Decrease in IBS-SSS by  $\geq 100$

|                                    | Responders     |                 |         | Non-responders |                |         |
|------------------------------------|----------------|-----------------|---------|----------------|----------------|---------|
| Change in clinical parameters      | Pre-LFM (n=34) | Post-LFM (n=34) | P value | Pre-LFM (n=8)  | Post-LFM (n=8) | P value |
| Mean IBS-SSS score                 | 295.4          | 79.8            | <0.001  | 235            | 232            | 0.87    |
| Mean PROMIS abdominal pain score   | 62.5           | 38.8            | 0.002   | 64.5           | 61.8           | 0.18    |
| Mean PROMIS diarrhea score         | 59.6           | 44.4            | 0.02    | 57.2           | 58.1           | 0.72    |
| Mean weekly BSFS stool consistency | 5.4            | 4.1             | 0.009   | 5.2            | 4.8            | 0.26    |

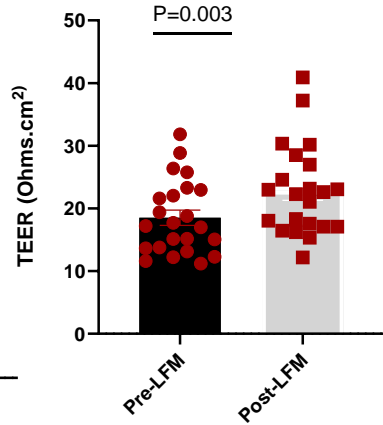


# LFM improves barrier function in patients with IBS-D

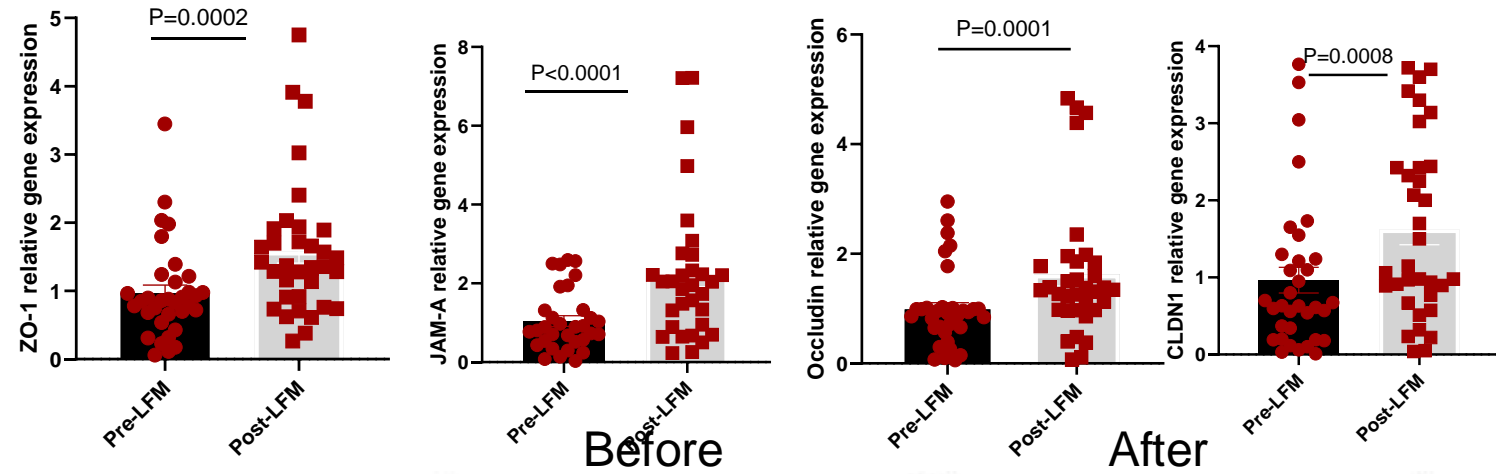
A



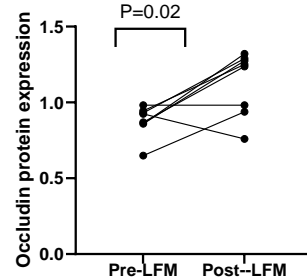
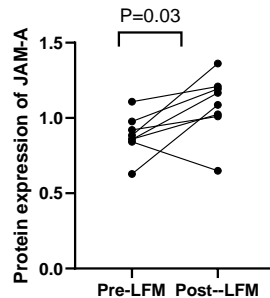
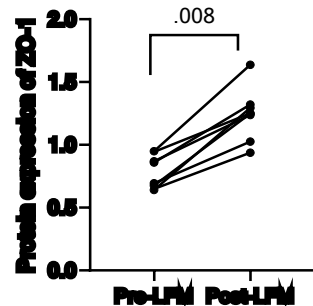
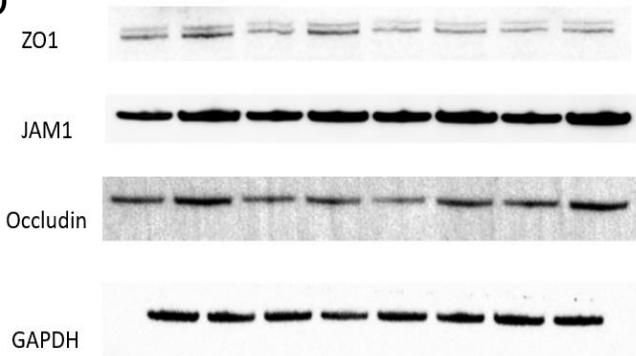
B



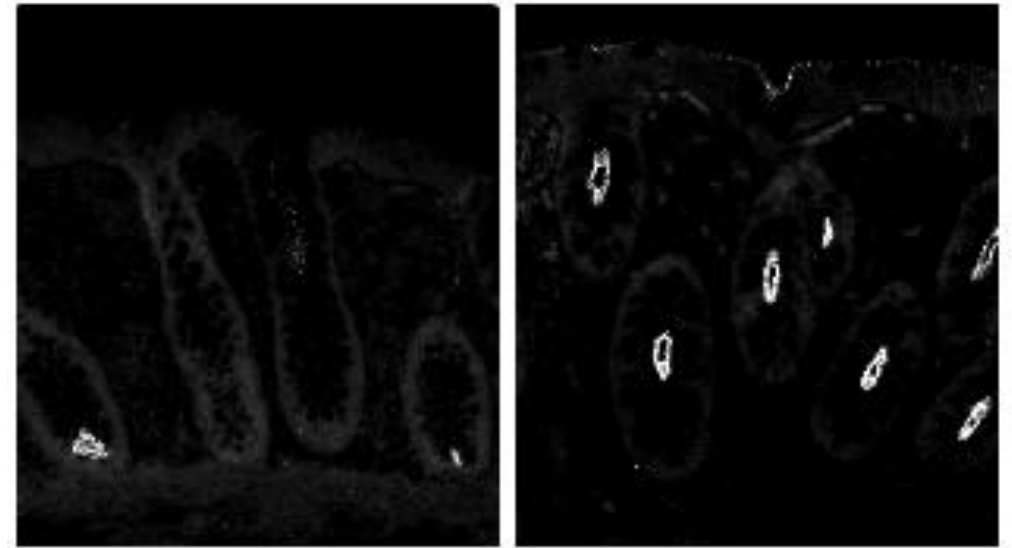
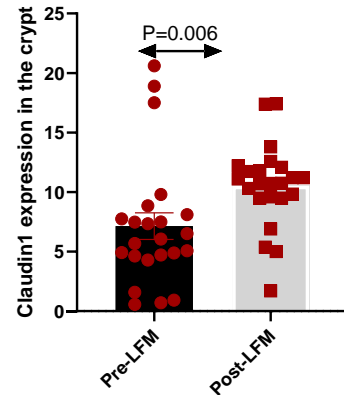
C



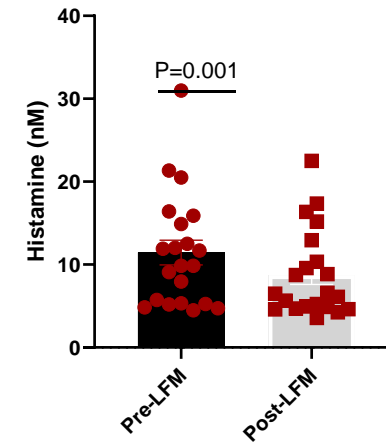
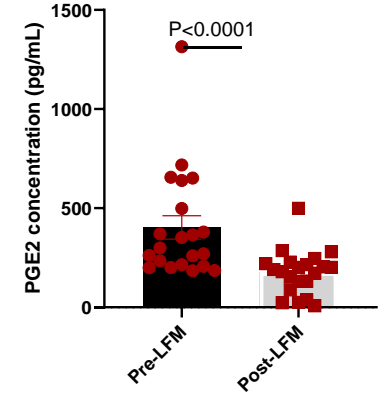
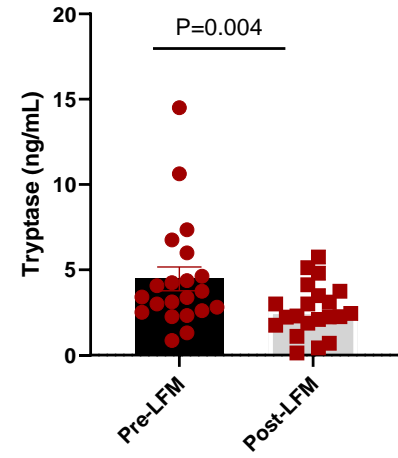
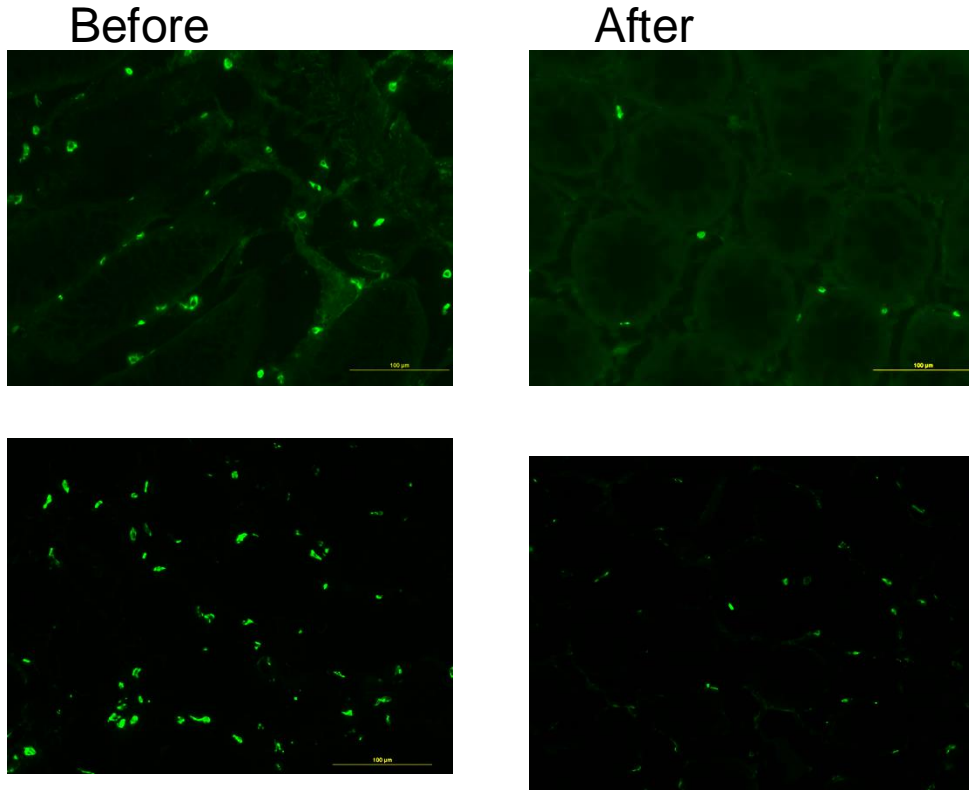
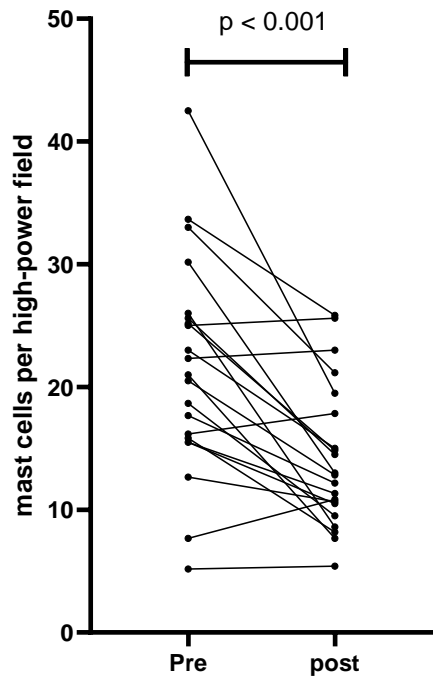
D



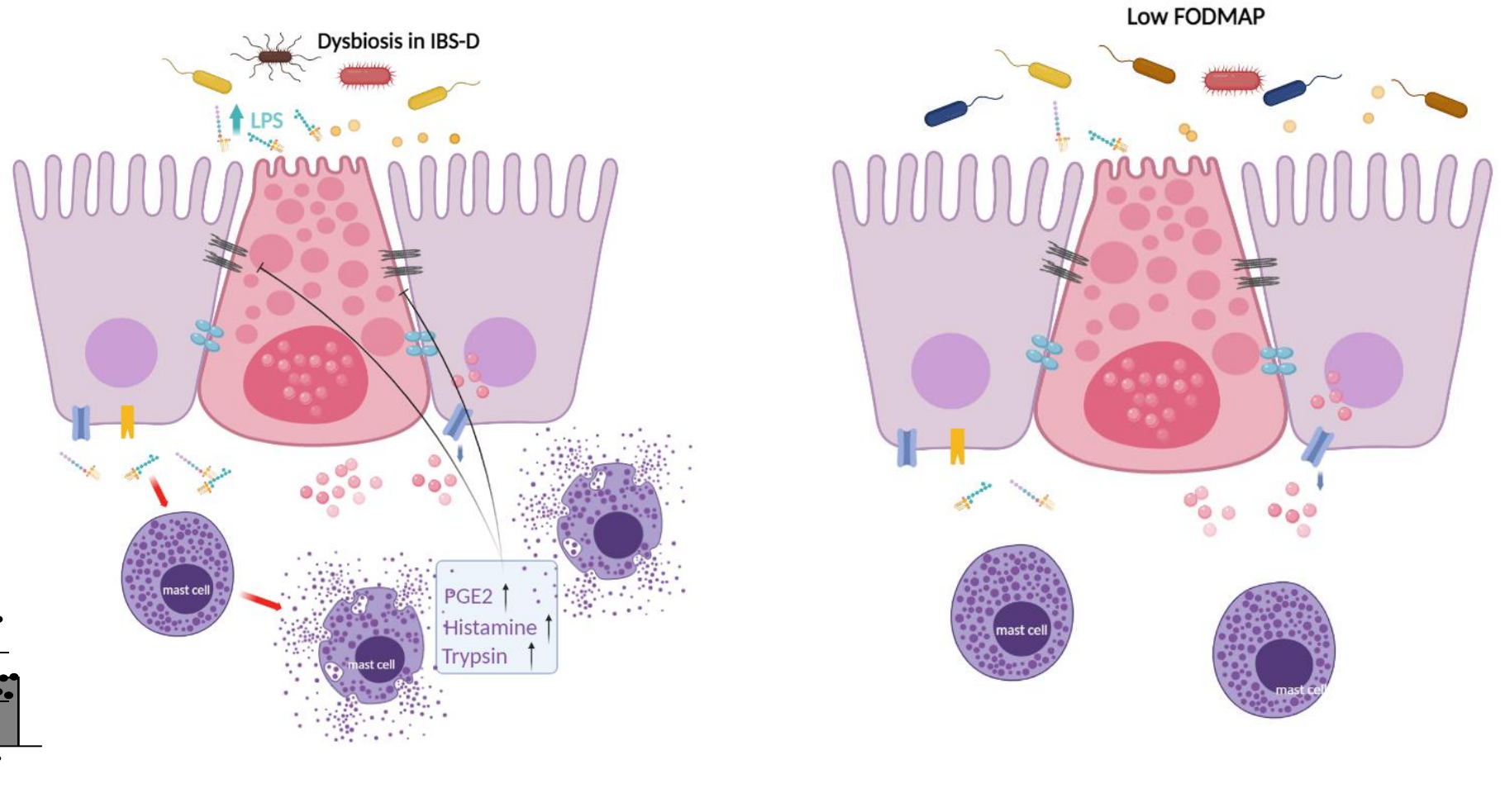
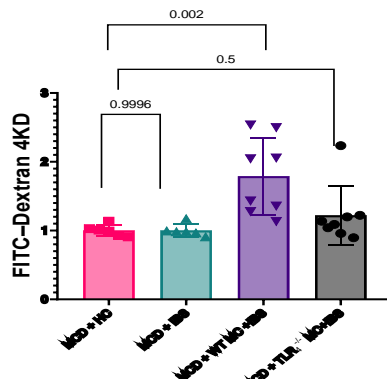
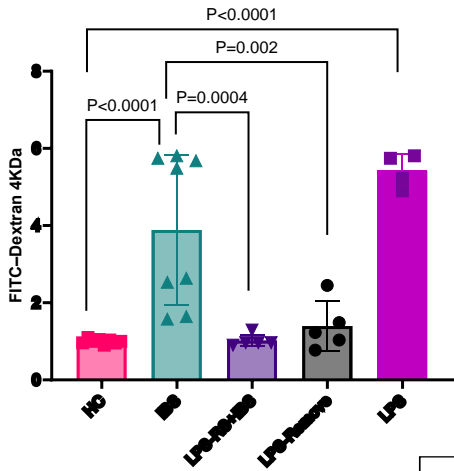
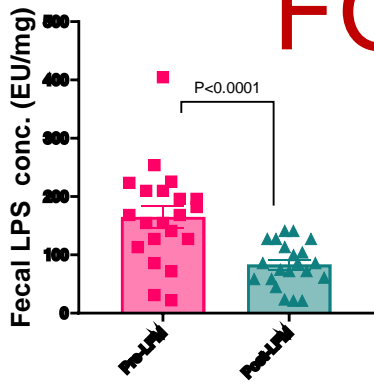
E



# LFM improves colonic mast cell infiltration in IBS-D patients



# Fecal LPS-driven mast cell activation causes FODMAP-mediated barrier dysfunction

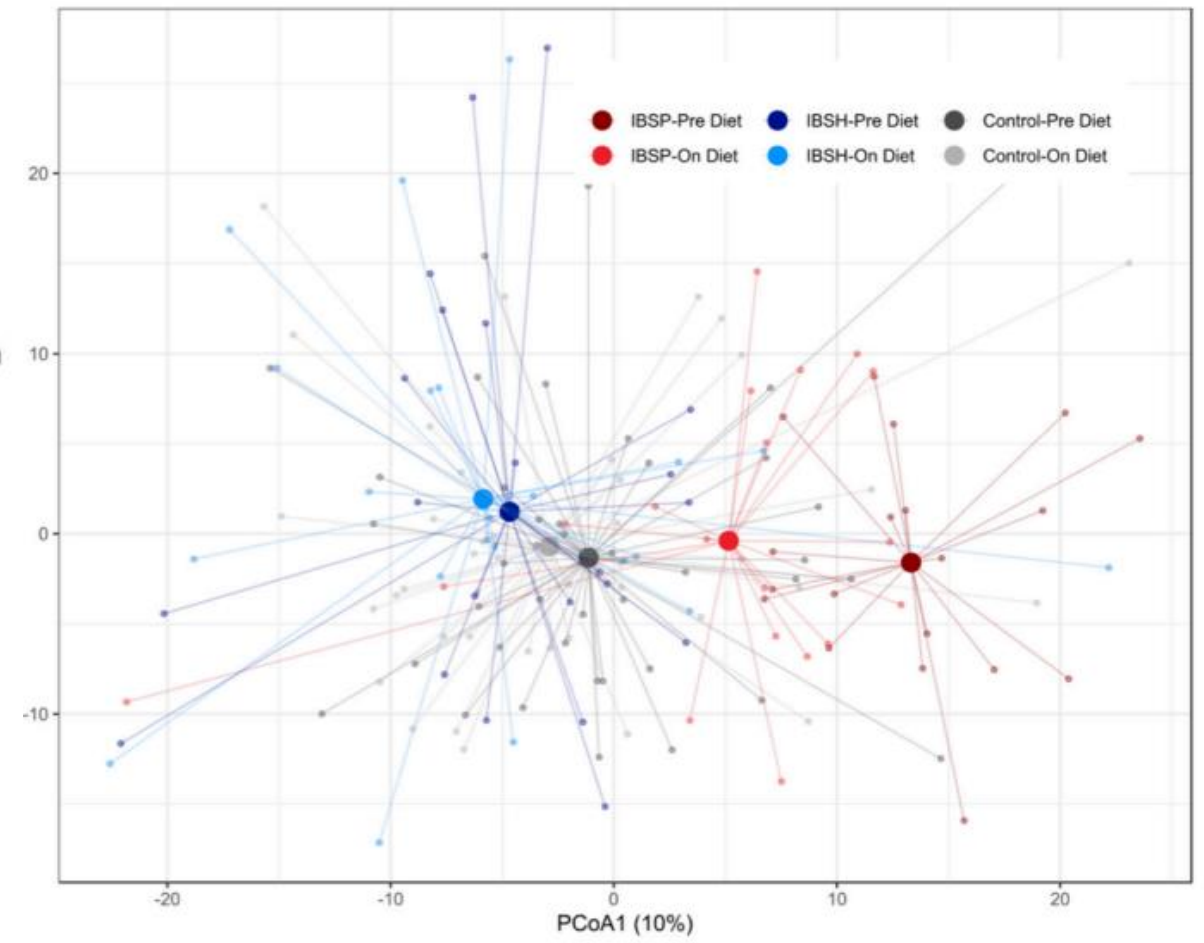
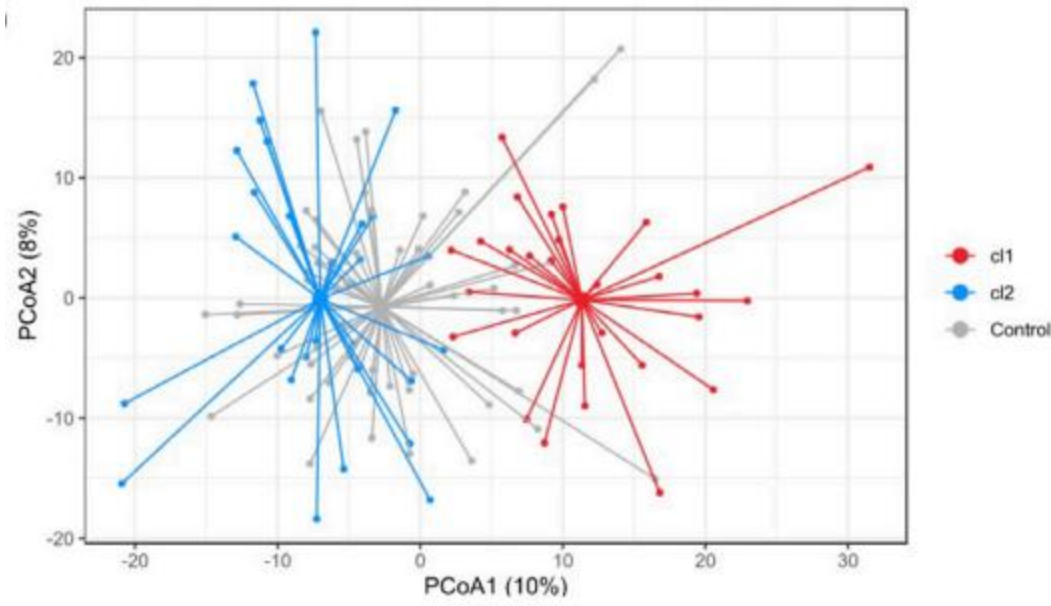


# Learning Objectives

- Why use it?
- When to use it (and when not to)
- How to use it?
- How does it work?
- **Who should we use it in?**



# Two microbiota subtypes identified in irritable bowel syndrome with distinct responses to the low FODMAP diet



# No biomarkers are available, till then..

- Clinical judgment
  - Pain and bloating are predominant symptoms (all IBS subtypes)
  - Motivated to try dietary therapies
  - Some data that higher symptom severity more likely to respond
  - No red-flags



# Learning Objectives

- List other dietary therapies in IBS (old and new).





# NICE Diet

- No RCTs comparing this approach with habitual or sham dietary interventions.
- A recent meta-analysis found that the NICE guidelines were not superior to any of the alternative or control dietary interventions analyzed

## Overarching recommendations

| Dietary advice | Specific dietary modifications   |
|----------------|--|
| Meal timing    | <ul style="list-style-type: none"><li>• Consume regular meals</li><li>• Sit down to eat, chew foods well, and take time to eat</li><li>• Avoid skipping meals</li><li>• Avoid eating late at night</li></ul>                         |
| Fluids         | <ul style="list-style-type: none"><li>• Drink <math>\geq 8</math> cups fluid per d</li><li>• Prioritize water and noncaffeinated drinks</li><li>• Restrict tea and coffee</li><li>• Restrict alcohol and carbonated drinks</li></ul> |
| Fiber          | <ul style="list-style-type: none"><li>• If increasing fiber, increase soluble fiber sources such as oats</li><li>• Limit intake of fruits to 3 portions daily</li><li>• Avoid supplementation with wheat bran</li></ul>              |
| Trigger foods  | <ul style="list-style-type: none"><li>• Limit spicy foods if believed to be a trigger</li><li>• Limit fat intake if believed to be a trigger</li><li>• Trial a lactose-free diet if lactose is believed to</li></ul>                 |

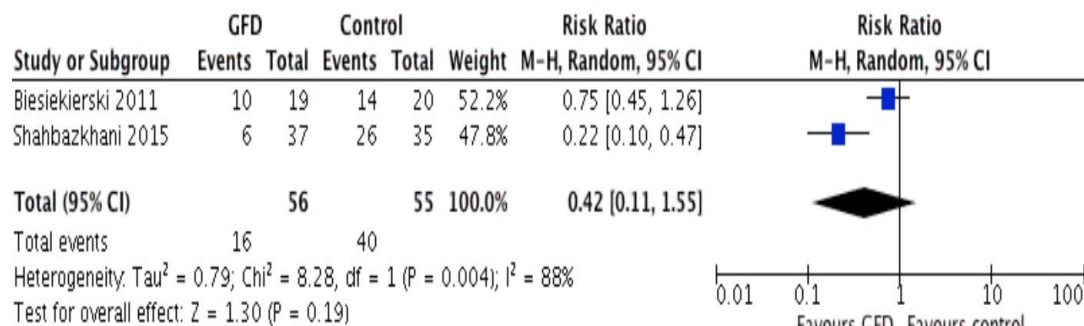


# Why use NICE diet

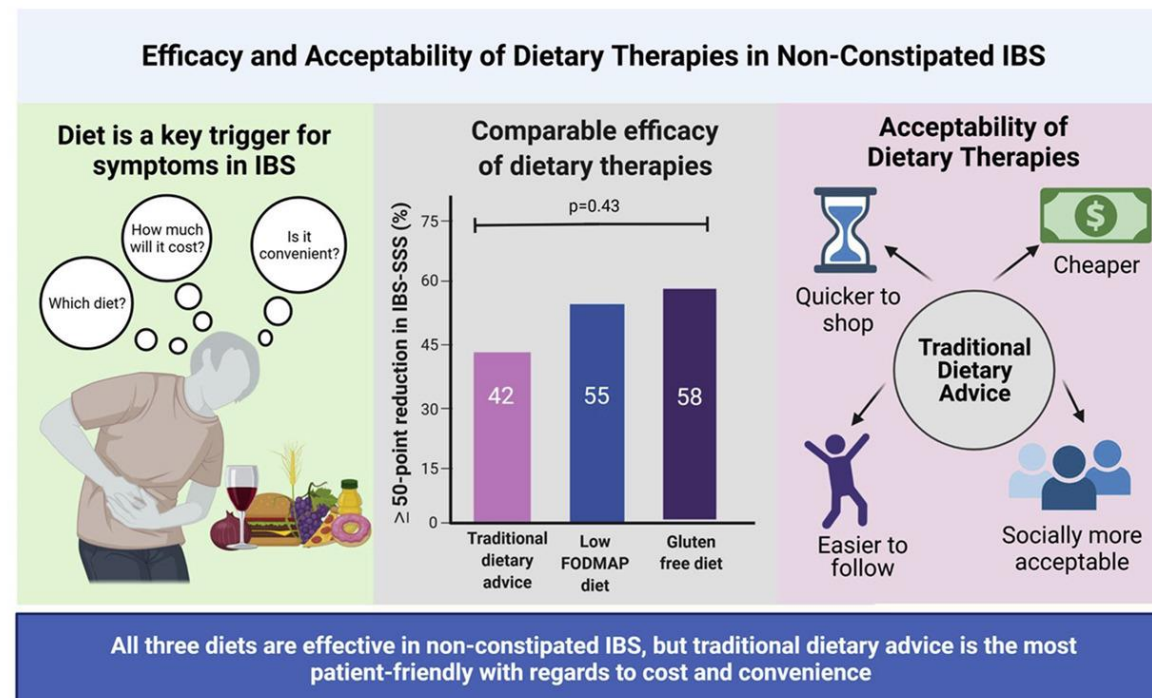
- Ease of implementation
- Individual trials show up to 40% of patients respond
- Might be helpful for patients who don't have a fixed meal routine or who needs "diet cleaning"
- More acceptable to patients



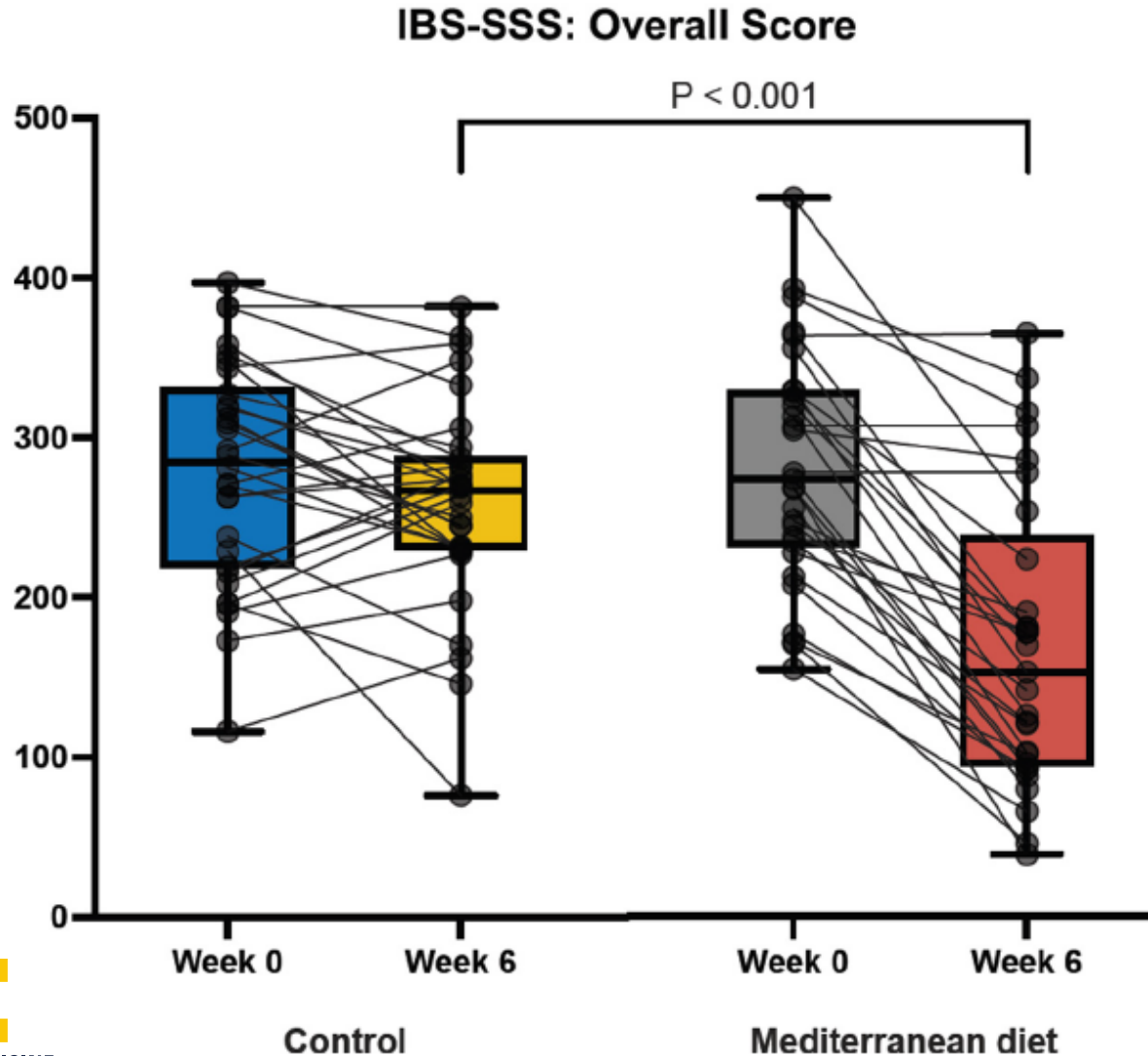
# Gluten-free diet in IBS



A GFD was associated with reduced global symptoms compared with a control diet (RR 0.42; 95% CI 0.11 to 1.55. I<sup>2</sup> = 88%), although this was not statistically significant.



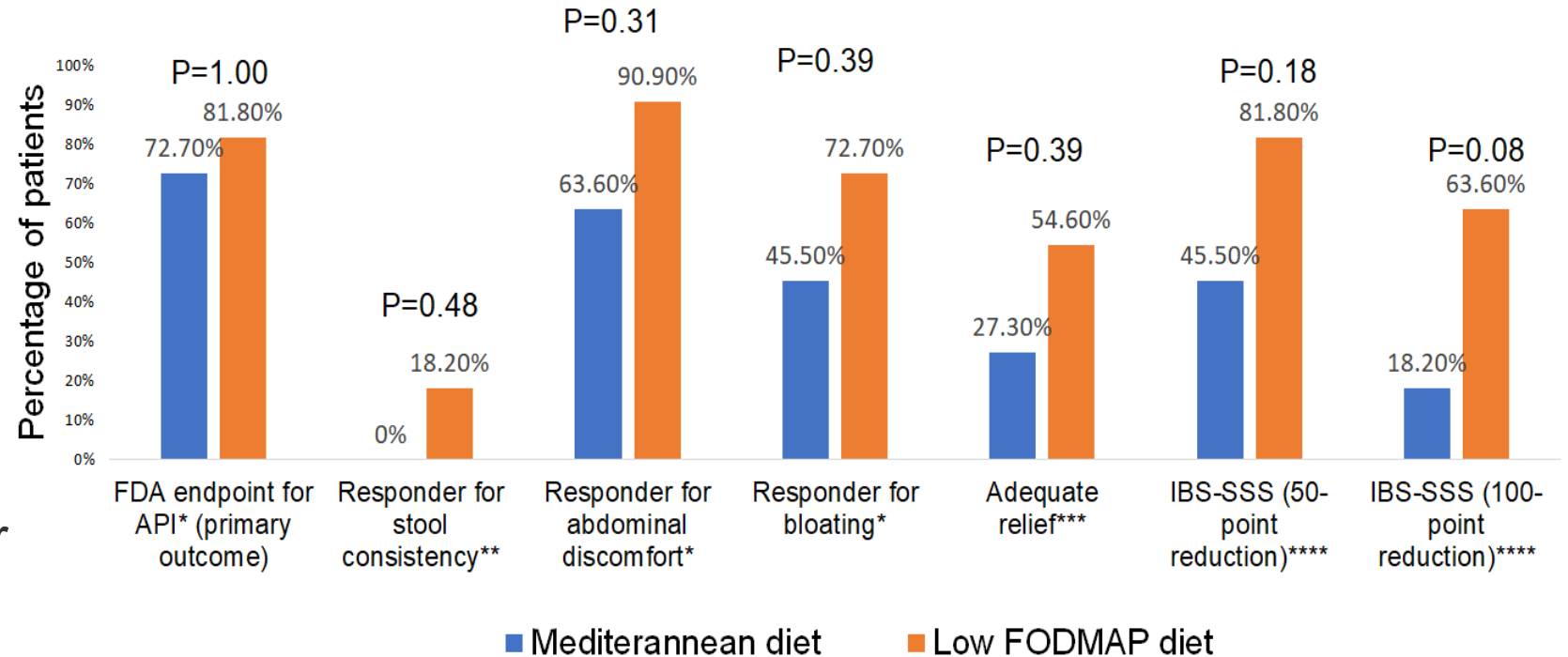
# Mediterranean diet in IBS



- Significantly higher responders in the Med diet group compared to the habitual diet (83% vs. 37%)
- Significantly higher improvement in
  - Anxiety
  - Depression
  - IBS-specific QoL

# MD is feasible and effective in patients with IBS

- Pilot, feasibility trial comparing MD vs. traditional LFD (n=22).
- MD improves abdominal symptoms in IBS.
- LFD appears to be better than MD in improving global IBS symptoms.



# IgG-based elimination diet in IBS

- IgG-based elimination diet offers a promising approach
- However, existing studies have significant limitations
  - Open-label
  - Lack of sham or control arms
  - Single center
  - Small sample size
  - No scientific rationale for selecting food for IgG assay
- Neither AGA nor ACG recommends use of IgG-based testing in IBS



# Novel discriminatory p-value-based IgG assay

90 Commonly consumed foods (wheat, corn, beef, soy, nuts, etc.)

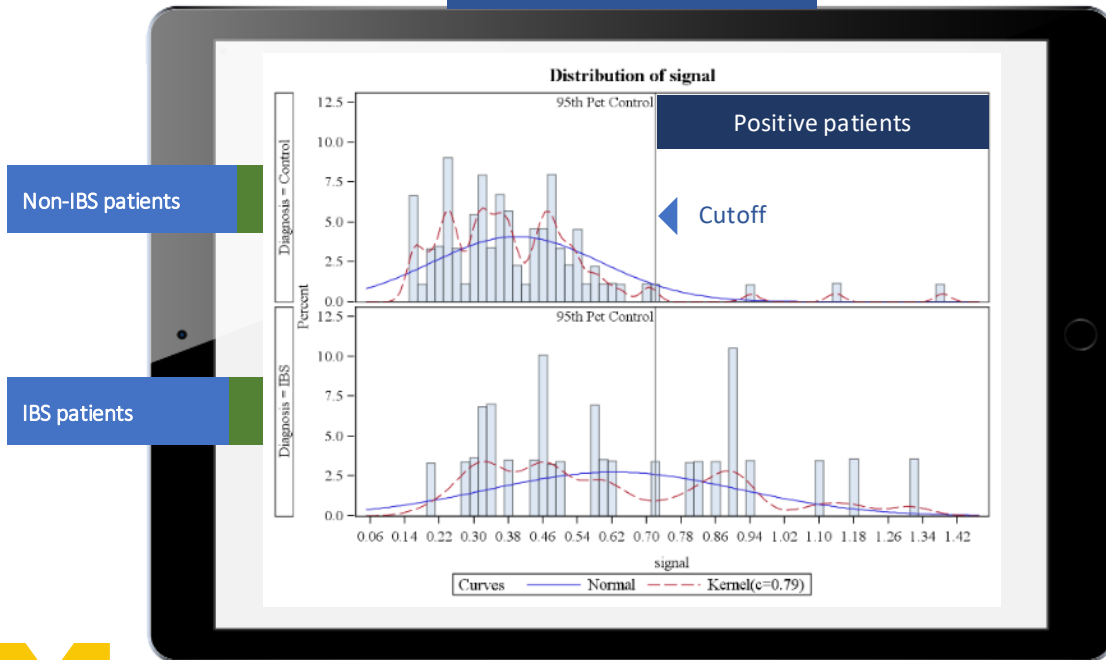
Testing IBS vs. non-IBS sera

50 foods with unadjusted p-values  $<0.05$

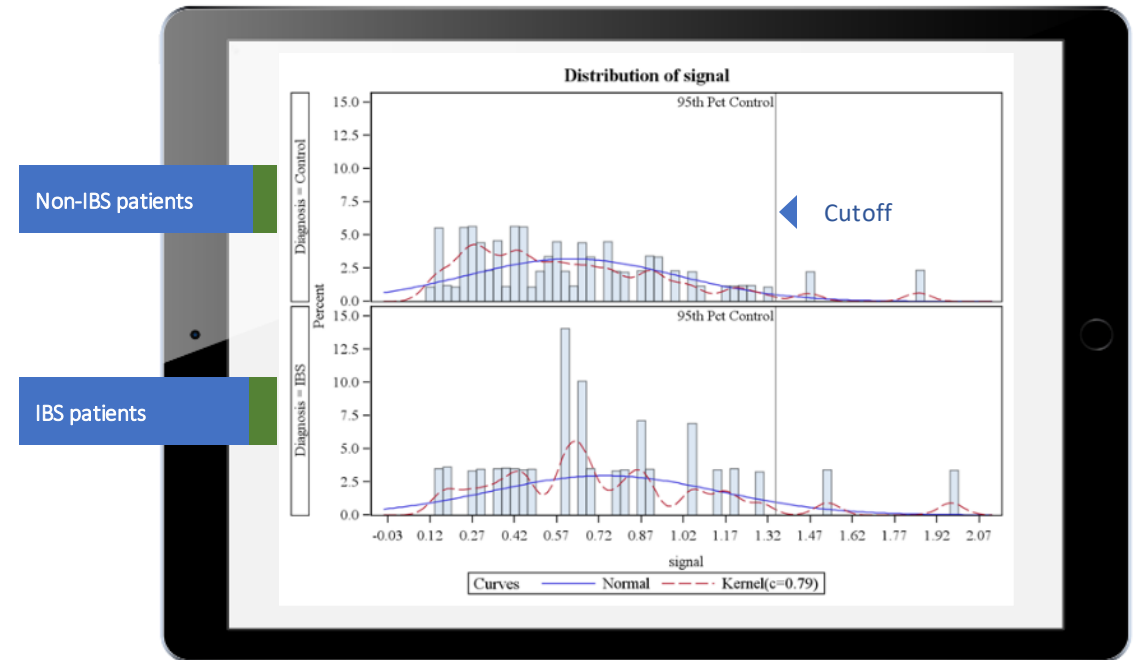
Statistical resampling and FDR adjustment

18 foods with FDR adjusted p-values  $<0.05$

Food A



Food B

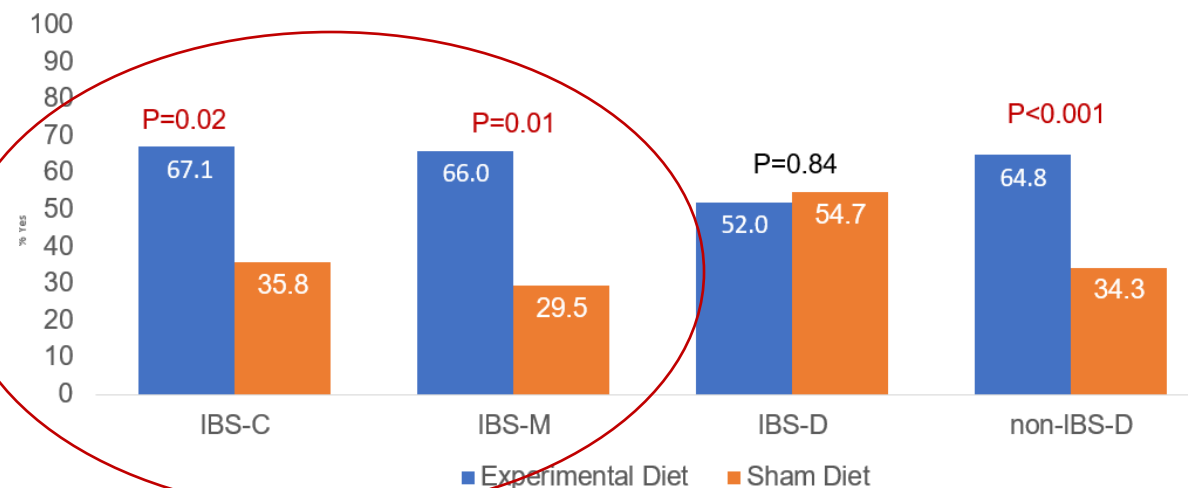


# Primary endpoint (change in API)

Table 2: Clinical outcomes between experimental and sham diet groups

|                        | Experimental Diet (n=118) | Sham Diet (n=105) | $\Delta$ | P value |
|------------------------|---------------------------|-------------------|----------|---------|
| <b>Primary Outcome</b> |                           |                   |          |         |
| 30% reduction in API   | 70 (59.6%)                | 44 (42.1%)        | 17.5%    | 0.02    |

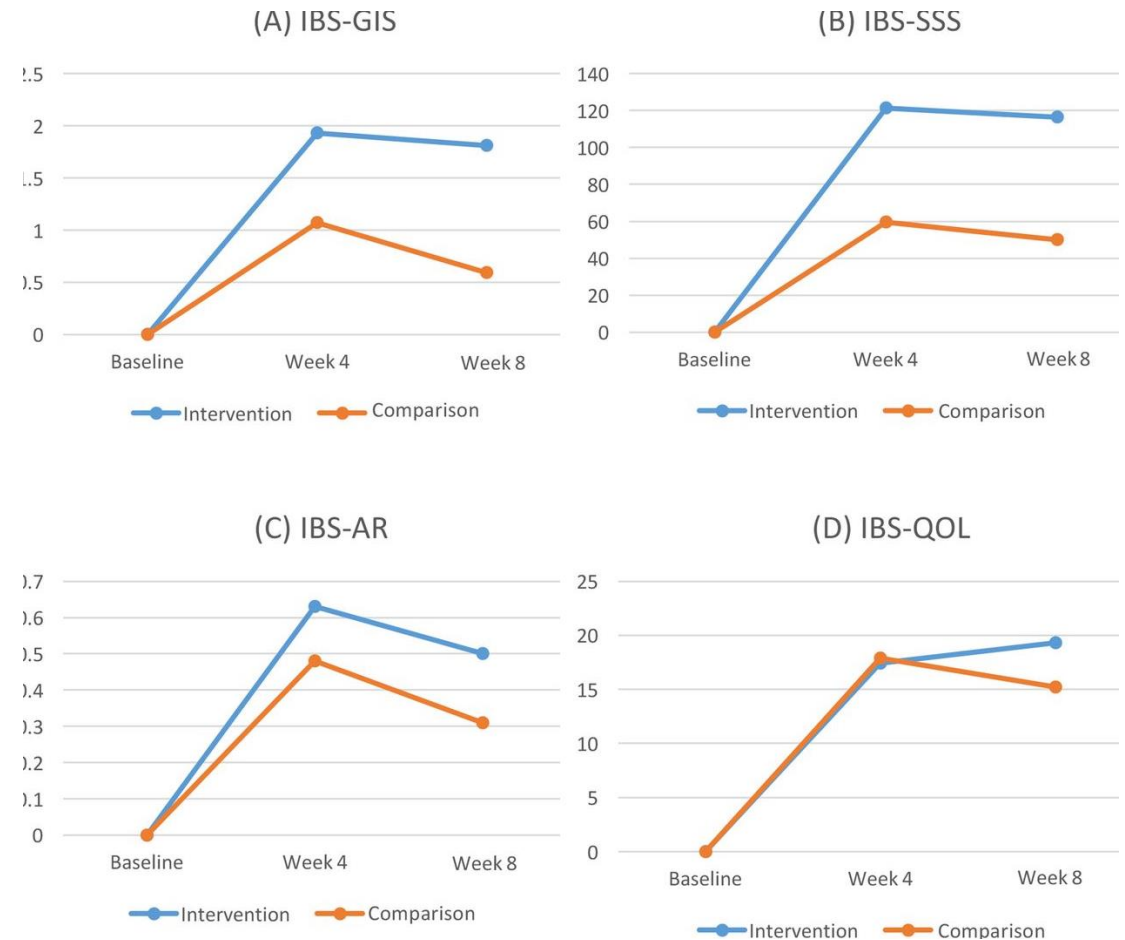
- Multi-center (8 centers)
- 8-week
- Sham-controlled
- Double-blind RCT
- The primary endpoint was the FDA definition of abdominal pain responder in IBS.





# Leukocyte activation testing (LAT) in IBS

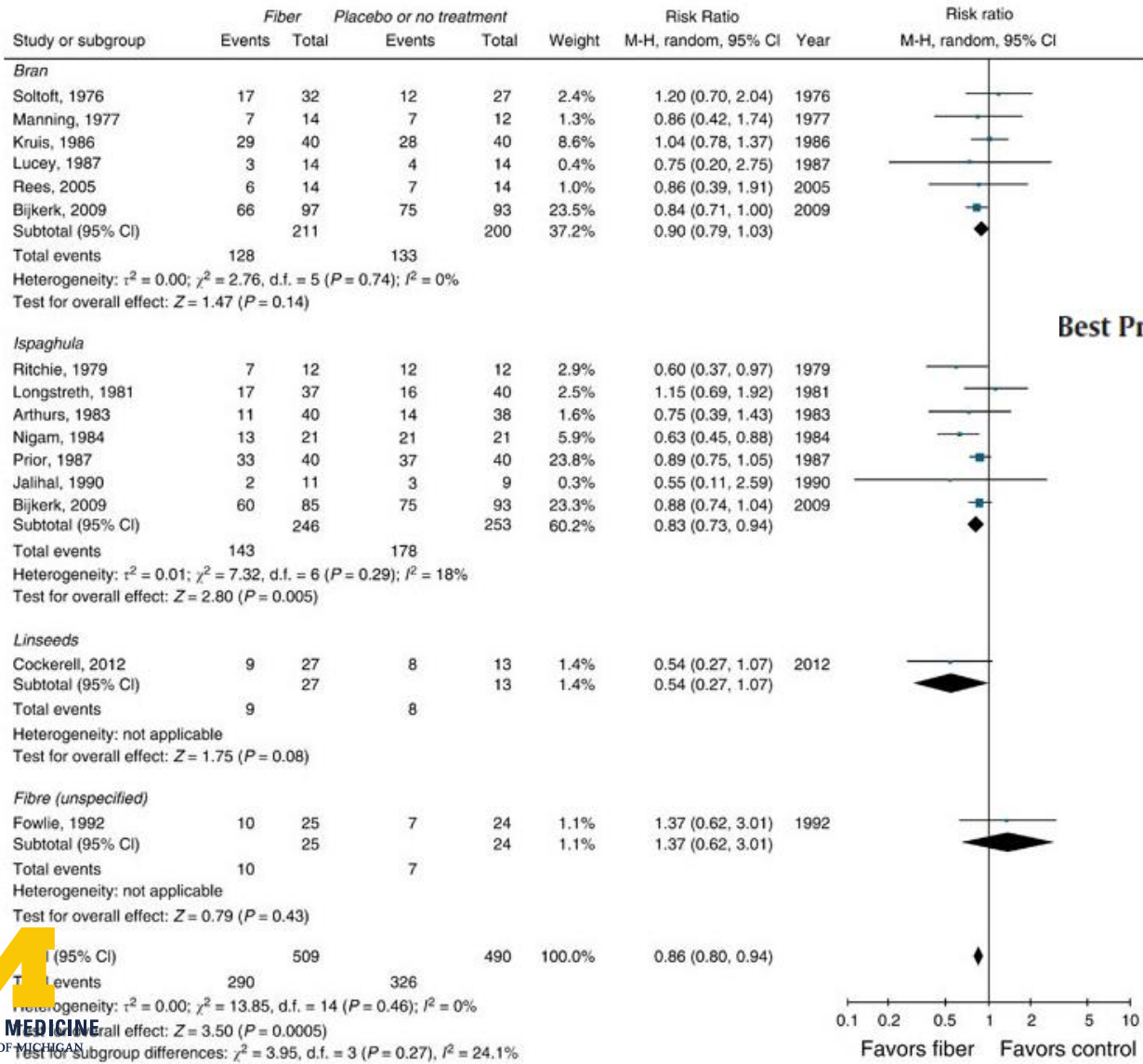
- Single center, double-blind, RCT
- N=58
- Primary outcome= IBS-GIS
- Elimination diet based on LAT better than a sham diet across multiple endpoints.
- ~200 food tested



The use of fiber and functional foods in IBS.



# Fiber in IBS



We suggest that soluble, but not insoluble, fiber be used to treat global IBS symptoms.  
Strong recommendation; moderate quality of evidence.

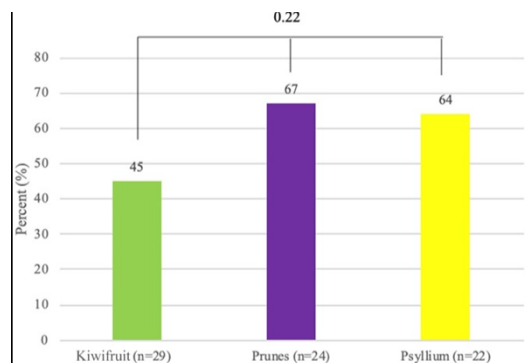
Best Practice Advice 5: Soluble fiber is efficacious in treating global symptoms of IBS.

ACG as well as AGA recommends the use of soluble IBS for global symptom improvement in IBS

# Functional foods in IBS



# Kiwifruit in IBS-C and FC

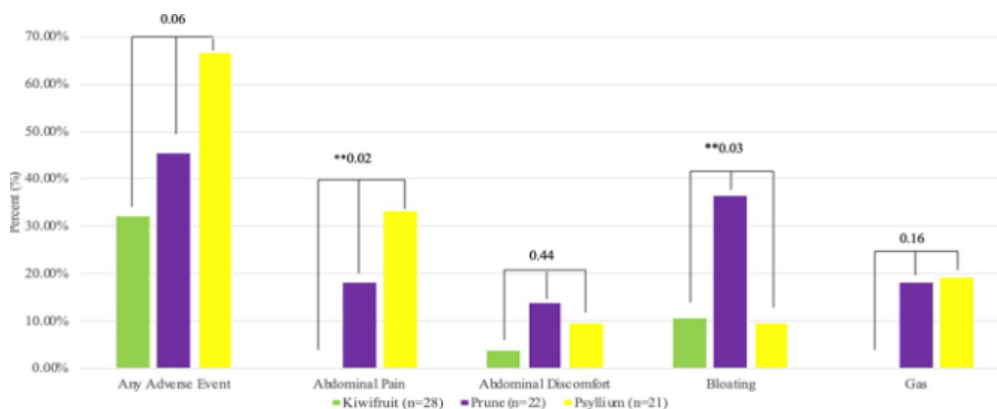


Two peeled kiwifruits per day can significantly improve

- stool frequency
- stool consistency
- abdominal pain

- Might be slightly less effective than prunes or psyllium in improving stool consistency

- Appears to be better tolerated than prunes and psyllium



# Prunes in IBS-C and FC

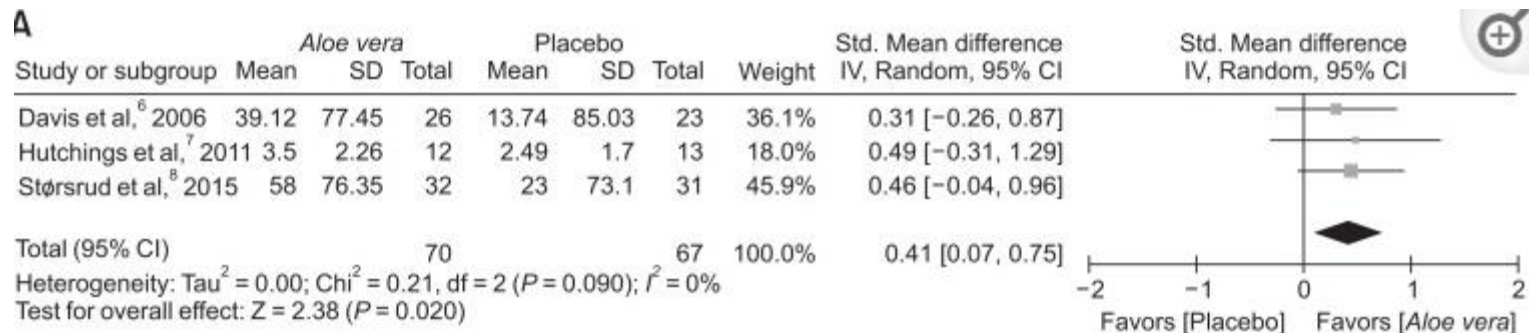
**Table 1** | Effects of dried plums and psyllium on the number of complete bowel movements (CBMs) per week, spontaneous bowel movements (SBMs) and bowel movements (BMs) at baseline, and during treatment and at 6-week follow-up (mean  $\pm$  S.E.M.)

|           | Baseline      | Dried plums   | Baseline      | Psyllium      | Follow-up     | P-value (dried plums vs. psyllium) |
|-----------|---------------|---------------|---------------|---------------|---------------|------------------------------------|
| CBMs/week | 2.8 $\pm$ 0.3 | 3.6 $\pm$ 0.4 | 2.7 $\pm$ 0.2 | 2.9 $\pm$ 0.3 | 2.5 $\pm$ 0.3 | 0.001                              |
| SBMs/week | 4.1 $\pm$ 0.4 | 6.5 $\pm$ 0.4 | 3.8 $\pm$ 0.4 | 5.4 $\pm$ 0.3 | 3.5 $\pm$ 0.4 | 0.04                               |
| BMs/week  | 4.4 $\pm$ 0.4 | 6.8 $\pm$ 0.5 | 4.1 $\pm$ 0.4 | 5.7 $\pm$ 0.6 | 4.4 $\pm$ 0.5 | 0.002                              |

- In RCTs, prunes in doses of 80–120 g/d (100 g = 12 prunes) significantly increase stool frequency and stool weight to a greater degree than placebo or psyllium in patients with FC
- Might be effective for mild-moderate constipation
- Limited data in IBS-C



# Aloe vera in IBS-C and FC



Barbaloin, one of the major components in AV, plays a critical role as a laxative

Small studies, total sample size including 3 studies around 150

Improves abdominal pain and bowel satisfaction.

The dose studied is between 100-200 ml daily.



# Summary of probiotics and prebiotics

- Recent guidelines by both the American College of Gastroenterology and the American Gastrointestinal Association either “recommend against” or make “no recommendation” for use of probiotics for treatment of IBS.
- Very limited data on prebiotics in IBS and unclear if it benefits our patients





# Summary

- LFD is the most evidence-based diet in IBS
- Abdominal pain and bloating are the symptoms most likely to improve with LFD
- Can be used in all IBS subtypes
- Could be considered as first-line therapy in IBS
- Use with caution and screen for ARFID/eating disorders



# Summary

- Simplistic view of LFD working via reduction in osmotic effect alone is likely not true
- It directly targets IBS pathophysiology by improving
  - Mast cell recruitment and activation
  - Barrier dysfunction
  - Visceral hypersensitivity
  - Fecal LPS appears to be a key mediator



# Summary

- A FODMAP-simple diet offers a promising alternative ‘step-up’ approach to implementing LFD
- Individualized approach to an elimination diet (e.g. IgG-based, LAT) or alternative approach (e.g. Mediterranean diet) is possible.
- For all these approaches, larger, adequately powered studies are needed



# Summary

- Soluble fiber should be used/considered for global IBS management
- Functional foods can also be used for the management of GI symptoms in IBS (more data is needed)
- Available data on dietary supplements, probiotics, and digestive enzymes (e.g. amylase, etc.) does not support their use in all IBS patients.



Thank you

Email: [singhpr@med.umich.edu](mailto:singhpr@med.umich.edu)