



# Prebiotic Guide

Make the connection between beneficial microbial markers and the prebiotics that nurture them.

- + INULIN
- + FOS
- + GOS
- + PECTIN
- + ELLAGIC ACID
- + RESISTANT STARCH
- + ARABINOXYLAN
- + BETA-GLUCAN

**CO-BIOME™**  
By MICROBA

# Prebiotics

**Prebiotics are substrates selectively utilised by gut microbes, offering health benefits to the host.<sup>1</sup> As clinicians, understanding the role of prebiotics in maintaining gut health is pivotal in managing various conditions and promoting overall well-being.**

In clinical practice, dietary intake of prebiotic and plant-based fibres is essential for maintaining microbial balance and promoting the production of short-chain fatty acids (SCFAs), which have been shown to suppress both intestinal and systemic inflammation.

Although there are recommended targets for fibre intake, there isn't a universally agreed upon daily target recommendation for prebiotic intake.

## Testing for valuable insights

Testing the gut microbiome can provide valuable insights into the potential for your patient's gut microbiome to impact their health. Equipped with this information, you can make informed clinical decisions and provide your patients with personalised prebiotic recommendations to better support and manage their health.

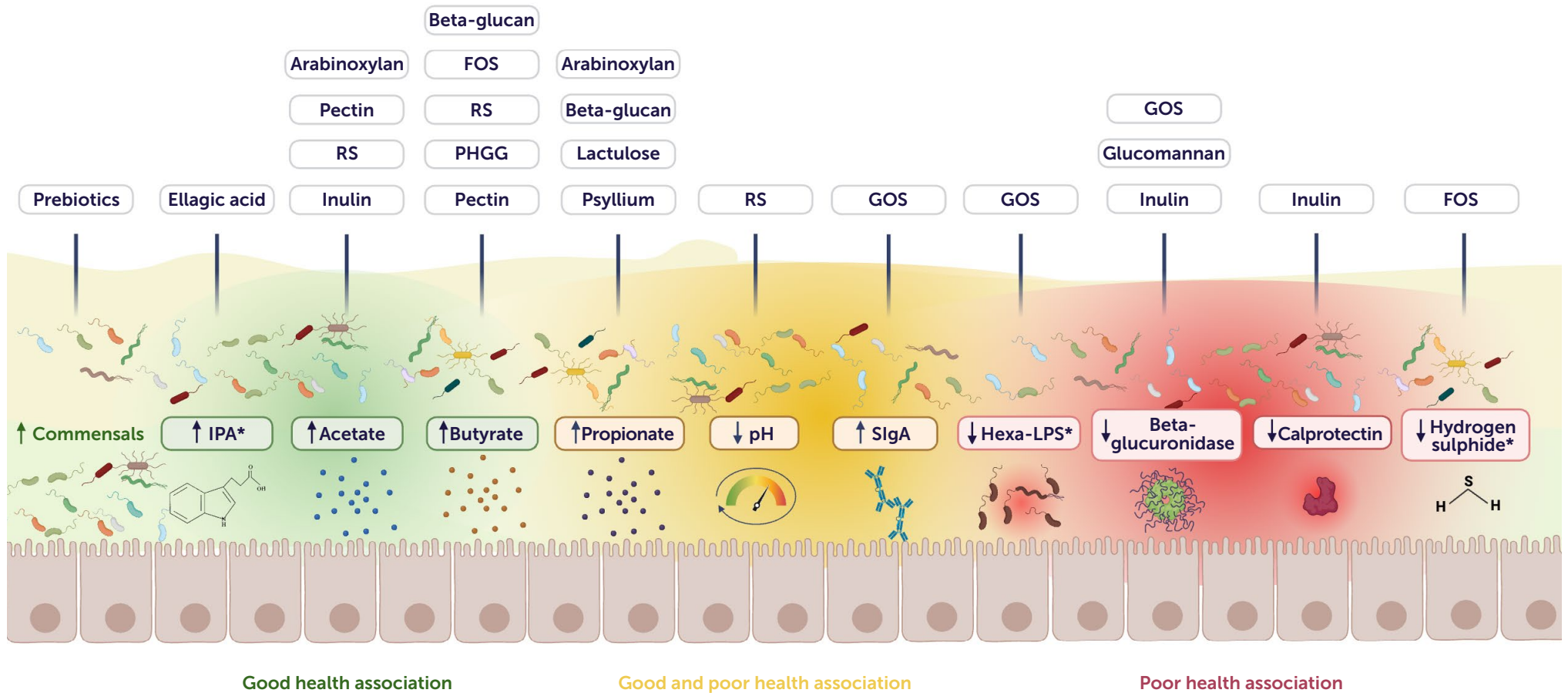
# Prebiotics for gut microbiome modulation

Clinically, prebiotics play a crucial role in modulating the gut microbiome through various mechanisms:

- 1. Promotion of beneficial SCFAs:** prebiotics facilitate the production of SCFAs, such as butyrate, acetate, and propionate, which play a pivotal role in maintaining gut health and reducing inflammation.<sup>2-3</sup>
- 2. Reduction of detrimental microbial markers:** by supporting beneficial microbes, prebiotics can influence the microbiome, thereby mitigating the production of detrimental microbial markers.<sup>3</sup>
- 3. Shifting microbiome composition:** prebiotics may promote the growth of microbial species associated with good health while inhibiting the proliferation of species linked to poor health outcomes.<sup>2-3</sup>

Prebiotics offer clinicians a targeted approach to modulate the gut microbiome, improve gastrointestinal function and influence systemic health.





FOS - fructooligosaccharides  
 GOS - galacto-oligosaccharides  
 PHGG - partially hydrolysed guar gum  
 RS - resistant starch

IPA - 3-indolepropionic acid  
 SIgA - secretory IgA  
 Hexa-LPS - hexa-acylated lipopolysaccharides

\*Exclusive to the MetaXplore range

# Food Sources of Prebiotics

	INULIN	FOS	GOS	PECTIN	ELLAGIC ACID	RESISTANT STARCH	ARABINOXYLAN	BETA-GLUCAN
<b>VEGETABLES (raw)</b>								
Artichoke, globe, 1/2 cup	Best	Moderate		High				
Artichoke, Jerusalem, 1/2 cup	Very best	Very best						
Asparagus, 1/2 cup	Best	High						
Avocado, 1/2 cup				High				
Beetroot, 1/2 cup		Moderate		Moderate				
Bok choy, 1/2 cup				Moderate				
Broccoli, 1/2 cup				High				
Broccoli, stalks, 1/2 cup		Best						
Brussels sprouts, 1/2 cup		High		High				
Cabbage, 1/2 cup				Moderate				
Cabbage, red, 1/2 cup		High						
Cabbage, savoy, 1/2 cup		Moderate						
Carrot, 1/2 cup				High				
Cauliflower, 1/2 cup				Moderate				
Celery, 1/2 cup				Moderate				
Chicory root powder, 1 tsp	High							
Eggplant, 1/2 cup				Moderate				
Endive, 1/2 cup				Best				
Fennel bulb, 1/2 cup		High						
Garlic, 1 clove	Moderate							
Green beans, 1/2 cup				Moderate				
Kale, 1/2 cup				Best				
Kohlrabi, 1/2 cup				Moderate				

	INULIN	FOS	GOS	PECTIN	ELLAGIC ACID	RESISTANT STARCH	ARABINOXYLAN	BETA-GLUCAN
<b>VEGETABLES cont.</b>								
Leek, 1/2 cup	Best	High						
Mushrooms, button, 1/2 cup		High						High
Mushrooms, cup/flat/brown, 1/2 cup								High
Mushrooms, oyster/shimenji/shiitake, 1/2 cup								Best
Okra, 1/2 cup		Moderate		Moderate				
Olives , 1/2 cup				Moderate				
Onion, red, 1/4 cup	High	Best						
Onion, white, 1/4 cup	High	High						
Parsnip, 1/2 cup				Best				
Peas, canned, 1/2 cup						Moderate		
Peas, green, 1/2 cup	Moderate			Moderate		High		
Potato, cooked, 1/2 cup						Moderate		
Potato, cooked then chilled, 1/2 cup						High		
Potato, cooked, chilled, then reheated, 1/2 cup						Best		
Sauerkraut, 1/2 cup				High				
Scallion/spring onion, 1 stalk		Moderate						
Shallot, 1 bulb	Moderate	Moderate						
Snow peas, 1/2 cup		High						
Swede, 1/2 cup				High				
Sweet corn, cooked, 1/2 cup						Moderate		
Sweet potato, 1/2 cup	Moderate			Moderate				
Swiss chard, 1/2 cup				Moderate				

	INULIN	FOS	GOS	PECTIN	ELLAGIC ACID	RESISTANT STARCH	ARABINOXYLAN	BETA-GLUCAN
FRUIT								
Apple, 1 cup				High				
Apricot, 1 cup				High				
Banana, green, flour, 1 tbsp						Very best		
Banana, ripe, 1 large	Moderate	High		High		High		
Banana, semi-ripe, 1 large						Very best		
Blackberries, 1 cup				Best	Moderate			
Blueberries, 1 cup				High				
Cherries, 1 cup				Moderate				
Dried fruit, prunes/figs/apricot/dates, 30g				High				
Kakadu plum, freeze dried, 1 tsp					Very best			
Kiwi, 1 cup				Moderate				
Longan, 1 cup		Best						
Mandarins, 1 cup				Best				
Mango, 1 cup				High				
Nectarine, 1 cup				Moderate				
Orange, 1 cup				Best				
Papaya/paw paw, 1 cup				Best				
Peach, 1 cup				High				
Pear, 1 cup				Best				
Plums, red, 1 cup		Moderate		High				
Pomegranate arils, 1/3 cup					Moderate			
Pomegranate juice (from conc.), 1 cup					Moderate			
Raspberries, 1 cup				High	Best			
Red currants, 1 cup		High						
Red dragon fruit, 1 cup	Moderate							
Rhubarb, 1 cup				Moderate				
Rockmelon or honeydew, 1 cup				Moderate				
Strawberries, 1 cup				High	Moderate			
Watermelon, 1 cup		Best						

	INULIN	FOS	GOS	PECTIN	ELLAGIC ACID	RESISTANT STARCH	ARABINOXYLAN	BETA-GLUCAN
<b>LEGUMES</b>								
Adzuki beans, boiled or canned, 1/2 cup			High					
Baked beans, canned, 1/2 cup				Moderate		Best		
Black beans, boiled, 1/2 cup				Moderate				
Black eyed peas, boiled, 1/2 cup				Moderate				
Borlotti beans, canned, 1/2 cup			Best					
Butter beans, canned, 1/2 cup		Moderate	High			Best		
Chickpeas, boiled, 1/2 cup			Best					
Chickpeas, canned, 1/2 cup			Moderate			High		
Chickpeas, sprouted, 1/2 cup			High					
Fava beans, canned, 1/2 cup						Best		
Great northern beans, boiled, 1/2 cup				High				
Lentils, canned, 1/2 cup			Moderate					
Lentils, cooked and chilled (+/- reheating), 1/2 cup						High		
Lentils, green, boiled, 1/2 cup			Best			Moderate		
Lentils, red, boiled, 1/2 cup			High			Moderate		
Lima beans, boiled, 1/2 cup			Best					
Mixed beans, canned, 1/2 cup			High			Moderate		
Mung beans, boiled, 1/2 cup			High					
Navy beans, boiled, 1/2 cup			Best	Moderate				
Pinto refried beans, canned, 1/2 cup						Moderate		
Red kidney beans, canned, 1/2 cup		High	Best	Moderate		Best		
Red kidney beans, cooked, 1/2 cup						Moderate		
Soy flour, dehulled, 1/3 cup			Best					
Soy yoghurt, plain, 140g			High					
Soybean chicken strips, 100g			Moderate					
Soybeans, boiled, 1/2 cup			Best					
Split peas, boiled, 1/2 cup			Best					
Textured vegetable protein (soybean meal), 1/3 cup			Best					

	INULIN	FOS	GOS	PECTIN	ELLAGIC ACID	RESISTANT STARCH	ARABINOXYLAN	BETA-GLUCAN
GRAINS								
Amaranth, uncooked, ¼ cup			Moderate					
Barley, cooked, ½ cup						Best		
Barley, pearled or wholegrain, uncooked, 1/4 cup							High	Best
Bread, BARLEYmax® fortified, 1 slice								High
Bread, Helga's Prebiotic Barley, 1 slice								Moderate
Bread, pumpnickel, 1 slice							Best	
Bread, rye (made with 100% rye flour), 1 slice							High	
Bread, rye (made with rye and wheat flour), 1 slice							Moderate	
Bread, wheat, wholegrain, wholemeal or multigrain, 1 slice			Moderate				High	Moderate
Bulgur wheat, uncooked, ¼ cup							Best	
Corn cereal, flakes, ½ cup						Moderate		
Corn thins, 3 slices							Moderate	
Mountain Bread, barley, 2 slices								Best
Mountain Bread, rye, 2 slices							High	High
Muesli, ½ cup		Moderate	Moderate			Moderate		High
Multigrain cereal, ½ cup							High	
Oat bran, 1 tbsp							Moderate	Best
Oat flakes cereal, uncooked, ½ cup								High
Oat flour, ½ cup			Moderate					
Oat porridge, cooked, ¾ cup								Best
Oat-based biscuit, 1 biscuit								Moderate
Oat-based cereal bar, 1 bar								High
Oats, quick, uncooked, ½ cup			Moderate					



	INULIN	FOS	GOS	PECTIN	ELLAGIC ACID	RESISTANT STARCH	ARABINOXYLAN	BETA-GLUCAN
<b>GRAINS cont.</b>								
Oats, rolled, uncooked, 1/2 cup							High	Best
Popcorn, 2/3 cup							Best	
Rice, brown, uncooked, 1/4 cup							High	
Rice, white, long-grain, cooked, 1/2 cup						Moderate		
Rice, white, long-grain, cooked then chilled, 1/2 cup						High		
Rice, white, ready to heat, 1/2 cup						Best		
Rye, wholegrain, uncooked, 1/4 cup							Best	
Ryvita, 2 crispbreads		High					High	High
Sorghum cereal, 2 Gluten-free Weetbix							Moderate	High
Sorghum grain, 1/4 cup							Moderate	High
Wheat bran cereal, 1/2 cup		Moderate	High				Best	High
Wheat bran, raw, 1 tbsp		Moderate					Best	Moderate
Wheat germ, 1 tbsp			High					
Wholemeal pasta, uncooked, 1/4 cup							High	



	INULIN	FOS	GOS	PECTIN	ELLAGIC ACID	RESISTANT STARCH	ARABINOXYLAN	BETA-GLUCAN
NUTS/SEEDS								
Almonds, 30g				Moderate				
Cashews, activated, 30g			High					
Chestnuts, 30g					Moderate			
Peanuts, 30g				Moderate				
Pecans, 30g				Moderate	High			
Pistachios, 30g			Moderate					
Pistachios, activated, 30g			High					
Sunflower seeds, 30g		High						
Walnuts, 30g					Best			

## Prebiotic Supplements

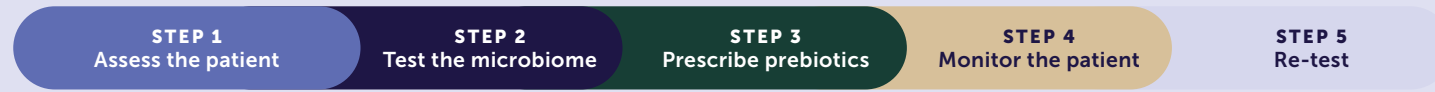
Prebiotic supplements may shift the composition of the gut microbiome to support patient outcomes. When it comes to supplementation it is important to match the prebiotic form, dose and duration recommended for your desired patient outcome. Commonly prescribed prebiotic supplements include:



Prebiotic	Daily dosage range*	Common clinically effective dose	Flavour	Texture	Convenience	References
PHGG	5g – 20g	8g	Neutral	Soluble	Mixes in food/drink	4-5
Oat beta-glucan	3g – 6.6g	3.5g (lipids) 10g (stool form)	Slight oat	Viscous	Thickens, lumpy	6-7
Resistant starch type 2 (green banana flour)	10g – 40g	15g	Slight banana	Viscous	Thickens, separates	8-16
Glucomannan	4.5g	4.5g	Neutral	Viscous	Thickens, jelly-like	17
GOS	3g – 11g	5.5g	Sweet	Soluble	Mixes in food/drink	5,18-25
Inulin	10g – 15g	10g	Sweet	Soluble	Mixes in food/drink	5,21,25-35
FOS	7.5g – 30g	10g	Sweet	Soluble	Mixes in food/drink	5,21,25-35
Lactulose	3g – 25g	10g	Sweet	Liquid	Must be poured	36-38

\*Used in research

# Framework for Personalised Prebiotic Prescription



Assess	Patient's presentation – signs, symptoms, bowel habits, diet and lifestyle	<input type="checkbox"/>
	Patient's health goals and priorities	<input type="checkbox"/>
Test	Assess red flags and refer to a medical specialist, if necessary (faecal occult blood, calprotectin, lactoferrin, pancreatic elastase, pathogens)	<input type="checkbox"/>
	Assess gut terrain (faecal pH, secretory IgA, zonulin, mucin degradation, oral species)	<input type="checkbox"/>
	Assess dysbiosis (diversity & richness, microbial markers, species)	<input type="checkbox"/>
Prescribe	Prioritise MetaXplore report insights based on the microbiome markers that need addressing the most (via results range or via health categories)	<input type="checkbox"/>
	Select prebiotic food/supplement based on patient symptoms, bowel habits, health history, allergies, intolerances, tolerability, goals, motivations	<input type="checkbox"/>
Monitor	Use a therapeutic dose guided by research and patient tolerability	<input type="checkbox"/>
	The patient's response to the prebiotic prescription (tolerability, convenience, new symptoms)	<input type="checkbox"/>
	Patient symptom improvement	<input type="checkbox"/>
	Amendments to the dose	<input type="checkbox"/>
Re-test	Changes to the prebiotic prescription (add another prebiotic, change the prebiotic or remove the prebiotic)	<input type="checkbox"/>
	Re-test between 3-6 months to understand effectiveness of prebiotic intervention	<input type="checkbox"/>



Personalise the prebiotic to the patient, taking into account the clinical picture, goals and preferences, while being guided by the gut microbiome results.



Tolerance and acceptability can be a stumbling block. When in doubt, start conservatively and proceed with caution.



Dose according to the condition, being guided by the research. Always start with the lowest dose and build up from there.



If you're not testing, you're guessing.

## References:

1. ISAPP - International Scientific Association for Probiotics and Prebiotics [Internet]. 2018 [cited 2024 Jan 24]. Available from: <https://isappscience.org/>
2. Slavin J. Fiber and prebiotics: mechanisms and health benefits. *Nutrients*. 2013; 5(4):1417-1435. doi:10.3390/nu5041417
3. Gill SK, Rossi M, Bajka B, et al. Dietary fibre in gastrointestinal health and disease. *Nat Rev Gastroenterol Hepatol*. 2021; 18, 101-116. doi:10.1038/s41575-020-00375-4
4. Yasukawa Z, Inoue R, Ozeki M, et al. Effect of repeated consumption of partially hydrolyzed guar gum on fecal characteristics and gut microbiota: A randomized, double-blind, placebo-controlled, and parallel-group clinical trial. *Nutrients*. 2019;11(9):2170. doi:10.3390/nu11092170
5. Wilson B, Rossi M, Dimidi E, Whelan K. Prebiotics in irritable bowel syndrome and other functional bowel disorders in adults: a systematic review and meta-analysis of randomized controlled trials. *Am J Clin Nutr*. 2019;109(4):1098-111. doi: 10.1093/ajcn/nqy376.
6. Yu J, Xia J, Yang C, et al. Effects of Oat beta-glucan intake on lipid profiles in hypercholesterolemic adults: A systematic review and meta-analysis of randomized controlled trials. *Nutrients*. 2022;14(10):2043. doi: 10.3390/nu14102043.
7. Ho HVT, Sievenpiper JL, Zurbau A, et al. The effect of oat  $\beta$ -glucan on LDL-cholesterol, non-HDL-cholesterol and apoB for CVD risk reduction: A systematic review and meta-analysis of randomised-controlled trials. *Br J Nutr*. 2016;116(8):1369-82. doi: 10.1017/S000711451600341X.
8. Grubben MJ, van den Braak CC, Essenberg M, et al. Effect of resistant starch on potential biomarkers for colonic cancer risk in patients with colonic adenomas: A controlled trial. *Digestive diseases and sciences*, 2001, 46(4), 750-756. doi:10.1023/a:1010787931002.
9. Zhang L, Ouyang Y, Li H, Shen L, Ni Y, Fang Q, et al. Metabolic phenotypes and the gut microbiota in response to dietary resistant starch type 2 in normal-weight subjects: A randomized crossover trial. *Sci Rep*. 2019;9(1). doi: 10.1038/s41598-018-38216-9.
10. Halajzadeh J, Milajerdi A, Reiner Ž, et al. Effects of resistant starch on glycemic control, serum lipoproteins and systemic inflammation in patients with metabolic syndrome and related disorders: A systematic review and meta-analysis of randomized controlled clinical trials. *Critical Reviews in Food Science and Nutrition*. 2020;60(18):3172-84. doi: 10.1080/10408398.2019.1680950
11. Haghghatdoost F, Gholami A, Hariri M. Effect of resistant starch type 2 on inflammatory mediators: A systematic review and meta-analysis of randomized controlled trials. *Complementary Therapies in Medicine*. 2021;56:102597. doi: 10.1016/j.ctim.2020.102597.
12. Xiong K, Wang J, Kang T, Xu F, Ma A. Effects of resistant starch on glycaemic control: A systematic review and meta-analysis. *Br J Nutr*. 2021;125(11):1260-9. doi: 10.1017/S0007114520003700.
13. Snelson M, Jong J, Manolas D, et al. Metabolic effects of resistant starch type 2: A systematic literature review and meta-analysis of randomized controlled trials. *Nutrients*. 2019 Aug 8;11(8):1833. doi: 10.3390/nu11081833.
14. Gao C, Rao M, Huang W, et al. Resistant starch ameliorated insulin resistant in patients of type 2 diabetes with obesity: A systematic review and meta-analysis. *Lipids Health Dis*. 2019;18(1):205. doi: 10.1186/s12944-019-1127-z.
15. Hamilton K, Crowe T, Testro A. High amylase resistant starch to decrease stool output in people with short bowel syndrome: A pilot trial. *Clin Nutr ESPEN*. 2019;29:242-4. doi: 10.1016/j.clnesp.2018.10.006.
16. Sobh M, Montroy J, Daham Z, et al. Tolerability and SCFA production after resistant starch supplementation in humans: A systematic review of randomized controlled studies. *Am J Clin Nutr*. 2022;115(3):608-18. doi: 10.1093/ajcn/nqab402.
17. Wu WT, Cheng HC, Chen HL. Ameliorative effects of konjac glucomannan on human faecal  $\beta$ -glucuronidase activity, secondary bile acid levels and faecal water toxicity towards Caco-2 cells. *Br J Nutr*. 2011;105(4):593-600. doi:10.1017/S0007114510004009
18. Johnstone N, Milesi C, Burn O, et al. Anxiolytic effects of a galacto-oligosaccharides prebiotic in healthy females (18-25 years) with corresponding changes in gut bacterial composition. *Sci Rep*. 2021;11(1):8302. doi:10.1038/s41598-021-87865-w
19. Krumbek JA, Rasmussen HE, Hutkins RW, et al. Probiotic *Bifidobacterium* strains and galactooligosaccharides improve intestinal barrier function in obese adults but show no synergism when used together as synbiotics. *Microbiome*. 2018;6(1):121. doi:10.1186/s40168-018-0494-4
20. Dey K, Sheth M, Anand S, et al. Daily consumption of galactooligosaccharide gummies ameliorates constipation symptoms, gut dysbiosis, degree of depression and quality of life among sedentary university teaching staff: A double-blind randomized placebo control clinical trial. *Indian J Gastroenterol*. 2023;42(6):839-48. doi: 10.1007/s12664-023-01435-8
21. van Dokkum W, Wezendonk B, Srikumar TS, van den Heuvel EG. Effect of nondigestible oligosaccharides on large-bowel functions, blood lipid concentrations and glucose absorption in young healthy male subjects. *Eur J Clin Nutr*. 1999;53(1):1-7. doi:10.1038/sj.ejcn.1600668
22. Parker C, Hunter KA, Johnson MA, et al. Effects of 24-week prebiotic intervention on self-reported upper respiratory symptoms, gastrointestinal symptoms, and markers of immunity in elite rugby union players. *Eur J Sport Sci*. 2023;23(11):2232-9.
23. Vulevic J, Juric A, Tzortzis G, Gibson GR. A mixture of trans-galactooligosaccharides reduces markers of metabolic syndrome and modulates the fecal microbiota and immune function of overweight adults. *The Journal of Nutrition*. 2013;143(3):324-31. doi: 10.3945/jn.112.166132.
24. Wilms E, An R, Smolinska A, Stevens Y, et al. Galacto-oligosaccharides supplementation in prefrail older and healthy adults increased faecal bifidobacterial, but did not impact immune function and oxidative stress. *Clinical Nutrition*. 2021;40(5):3019. doi:10.1016/j.clnu.2020.12.034
25. van der Schoot A, Drysdale C, Whelan K, Dimidi E. The effect of fiber supplementation on chronic constipation in adults: An updated systematic review and meta-analysis of randomized controlled trials. *Am J Clin Nutr*. 2022;116(4):953-69. doi: 10.1093/ajcn/nqac184.
26. Lancaster SM, Lee-McMullen B, Abbott CW, et al. Global, distinctive, and personal changes in molecular and microbial profiles by specific fibers in humans. *Cell Host Microbe*. 2022;30(6):848-862.e7. doi:10.1016/j.chom.2022.03.036
27. Amadiou C, Coste V, Neyrinck AM, et al. Restoring an adequate dietary fiber intake by inulin supplementation: A pilot study showing an impact on gut microbiota and sociability in alcohol use disorder patients. *Gut Microbes*. 2022;14(1):2007042. doi:10.1080/19490976.2021.2007042
28. Leyrolle C, Cserjesi R, D G H Mulders M, Zamariola G, Hiel S, Gianfrancesco MA, et al. Prebiotic effect on mood in obese patients is determined by the initial gut microbiota composition: A randomized, controlled trial. *Brain Behav Immun*. 2021;94:289-98. doi:10.1016/j.bbi.2021.01.014
29. Slavin J, Feirtag J. Chicory inulin does not increase stool weight or speed up intestinal transit time in healthy male subjects. *Food Funct*. 2011;2(1):72-77. doi:10.1039/c0fo00101e
30. Fernandes R, Do Rosario VA, Mocellin MC, et al. Effects of inulin-type fructans, galacto-oligosaccharides and related synbiotics on inflammatory markers in adult patients with overweight or obesity: A systematic review. *Clinical Nutrition*. 2017;36(5):1197-206. doi: 10.1016/j.clnu.2016.10.003.
31. Valcheva R, Koleva P, Martínez I, et al. Inulin-type fructans improve active ulcerative colitis associated with microbiota changes and increased short-chain fatty acids levels. *Gut Microbes*. 2019;10(3):334-57. doi: 10.1080/19490976.2018.1526583.
32. Casellas F, Borruel N, Torrejón A, et al. Oral oligofructose-enriched inulin supplementation in acute ulcerative colitis is well tolerated and associated with lowered faecal calprotectin. *Alimentary Pharmacology & Therapeutics*. 2007;25(9):1061-7. doi: 10.1111/j.1365-2036.2007.03288.x
33. Liu F, Prabhakar M, Ju J, et al. Effect of inulin-type fructans on blood lipid profile and glucose level: A systematic review and meta-analysis of randomized controlled trials. *Eur J Clin Nutr*. 2017;71(1):9-20. doi: 10.1038/ejcn.2016.156.
34. Wang L, Yang H, Huang H, et al. Inulin-type fructans supplementation improves glycemic control for the prediabetes and type 2 diabetes populations: results from a GRADE-assessed systematic review and dose-response meta-analysis of 33 randomized controlled trials. *J Transl Med*. 2019;17(1):410. doi: 10.1186/s12967-019-02159-0.
35. Neyrinck AM, Rodriguez J, Zhang Z, et al. Prebiotic dietary fibre intervention improves fecal markers related to inflammation in obese patients: results from the Food4Gut randomized placebo-controlled trial. *Eur J Nutr*. 2021;60(6):3159-70. doi: 10.1007/s00394-021-02484-5.
36. Terada, A, Hara, H, Kataoka, M, Mitsuoka, T. Effect of lactulose on the composition and metabolic activity of the human faecal flora. *Microbial ecology in health and disease*. 1992;5(1):43-50. doi: 10.3109/08910609209141303
37. Fernandes J, Morali G, Wolever TM, et al. Effect of acute lactulose administration on serum acetate levels in cirrhosis. *Clin Invest Med*. 1994;17(3):218-25.
38. Vogt JA, Ishii-Schrade KB, Pencharz PB, et al. L-Rhamnose and lactulose decrease serum triacylglycerols and their rates of synthesis, but do not affect serum cholesterol concentrations in men. *The Journal of Nutrition*. 2006;136(8):2160-6. doi: 10.1093/jn/136.8.2160.

This guide has been developed for healthcare professionals. The MetaXplore range is only available for purchase through a healthcare professional.

The faecal occult blood, reverse transcriptase polymerase chain reaction (RT-PCR) and enzyme-linked immunosorbent assays (ELISA) used in the MetaXplore™ range are diagnostic and are approved for clinical use. The faeces pH assay used in the MetaXplore™ range is for research use only and not to be used as a basis for diagnosis. The metagenomic assays used in the MetaXplore™ range are to determine the microbiome populations and associated functional pathways in a faecal sample. The application is for research use only and is not to be used as a basis for diagnosis. Learn more about the journey we are on to validate this gold-standard technology for clinical diagnosis and application at co-biome.com. The MetaXplore™ testing range has been developed for adults 18 years or older and the microbiome results will be compared to a cohort of healthy adults. The clinical and research insights within the report are based on the assessment of the scientific literature in adults over 18 years of age.

**Co-Biome™ by Microba**  
Unlocking health  
from within

324 Queen St Brisbane,  
QLD, Australia 4000  
1300 974 621  
[info@co-biome.com](mailto:info@co-biome.com)

Mailing Address  
GPO Box 469  
Brisbane QLD 4001  
v1 May 24

**CO-BIOME™**  
By MICROBA