NMI Summit 2023. Author, Benjamin Brown.

Table: Diets used in clinical practice for symptoms of irritable bowel syndrome and corresponding biomarker tests.

Diet	**Diet description**	**Evidence for efficacy**	**Biomarkers**	**Biomarker evidence**
Traditional dietary advice	Recommendations include regular meals, adequate fluids, restrict caffeine, alcohol, fizzy drinks, limit fat, gas producing foods (e.g., onions, beans), fiber, resistant starch, spicy foods, and fruit, increase soluble fiber.[1] [2]	Head-to-head comparisons suggest similar efficacy to other dietary approaches (GFD, LFD) with better acceptance.[3]	N/A	N/A
Low-FODMAP diet	A diet low in fermentable oligosaccharides, disaccharides, monosaccharides, and polyols (FODMAPs) present in foods including certain grains, fruit, vegetables, legumes and sweeteners. The diet consists of three phases: a period of FODMAP restriction, reintroduction of individual food items to determine tolerance, and personalisation to create a modified FODMAP-	The LFD reduces global symptoms and has been found to be generally more effective than traditional dietary advice.[5]	Microbiome	Microbiome signatures, including a 'pathogenic' profile and 'dysbiosis index,' may predict response to diet in some,[6] [7] [8] [9] [10] but not all studies.[11] Relationships between dysbiosis and symptom improvement are contradictory.
			Faecal and urine metabolites	Pattern of 15 volatile organic compounds predicted response to diet with good accuracy, [12] while faecal propionate, cyclohexanecarboxylic acid esters, and urine metabolite profile also predicted clinical response.[13]

	containing diet based on individual tolerance.[4]			
Gluten-free diet	Complete exclusion of wheat, rye, and barley from the diet independent of wheat allergy and celiac disease (non-celiac wheat sensitivity), assessing clinical response and response to gluten challenge.[14]	Gluten elimination has been shown to reduce symptoms, and blinded gluten challenge to aggravate symptoms.[15 16 17 18 19] A GFD showed comparative efficacy to an LFD or traditional Mediterranean diet.[20]	HLA-DQ2 and HLA-DQ8	Predicted greater reduction in symptoms of depression and improvements in vitality, but not GI symptoms.[21] Only 50% of NCWS patients express the HLA-DQ2 and/or HLA-DQ8 genotype.[22]
			Antigliadin antibodies	Predicted greater reductions in symptoms, particularly diarrhoea.[23]
			Confocal laser endomicroscopy	Poor diagnostic accuracy.[24]
Elimination diets	Empirical elimination diets involve initial short-term restriction followed by re-challenge to assess tolerance to each food. Commonly restricted foods include seafood, wheat, corn, eggs, dairy, soy, nuts, citrus, and yeast.[25 26 27 28 29] Testing-led elimination diets follow the same procedure, but elimination is personalised based on test results.[30]	There is mixed evidence for empirical elimination re-challenge diets.[31 32 33 34] IgG antibody-led elimination diets reduce symptoms and improve quality of life but suffer from low evidence.[35] An IgG guided diet was superior to a LFD.[36]	IgG antibodies	IgG antibody-led elimination diets result in clinical improvement in symptoms.[37 38 39 40 41 42 43]
			Confocal laser endomicroscopy	Confocal laser endomicroscopy (CLE)-led elimination diets result in significant symptom improvement.[44 45 46] CLE is expensive, invasive and may lack accuracy.[47]
			Leukocyte activation assay	Leucocyte activation test-led elimination diets reduce symptoms.[48 49]

SIBO diet	Small intestinal bacterial overgrowth (SIBO) has controversially been proposed as a cause of IBS.[50] The LFD has been recommended during SIBO management with antibiotic therapy.[51]	A case report described benefit of a LFD and herbal antibiotic therapy,[52] no clinical trials have assessed the LFD for SIBO. A single study examined a short-term elemental diet.[53]	Hydrogen and methane breath testing	Breath testing has important limitations; it may not correlate with bacterial overgrowth (jejunal aspirate culture) or differentiate symptomatic subjects from healthy controls.[54] Breath testing has not yet been studied in relation to dietary management.[55]
Histamine diet	Recommendations vary but most often include restriction of cured and semi cured cheese, grated cheese, oily fish, canned and semi preserved oily fish derivatives, dry-fermented meat products, spinach, tomatoes, fermented cabbage, strawberries, citrus, wine, and beer.[56]	Histamine intolerance has been suggested in a subgroup of IBS patients.[57] [58] A histamine diet has been shown to reduce symptoms in patients presenting primarily with functional abdominal symptoms.[59] This is supported by benefit of DAO enzyme intervention on GI symptoms.[60] FODMAPs may favour the production of faecal histamine by Klebsiella aerogenes in a subgroup of IBS patients.[61] A moderate correlation was found between visceral pain severity and urinary histamine with an LFD.[62]	Serum DAO	Does not have reliable diagnostic value.[63] [64] Despite uncertainty, may be useful to complement diagnosis and prediction of clinical response to treatment.[65] [66]
			Urinary histamine	Methylhistamine in urine is emerging as a potential biomarker.[67] [68]
			DAO gene variants	The relevance of gene variants to histamine intolerance is unknown.[69] DAO gene variants were associated with lower serum DAO in a subgroup of people with histamine intolerance, but not with clinical histamine intolerance phenotype.[70]

Low sucrose diet	Modified dietary guidelines for patients with congenital sucrase-isomaltase deficiency including avoiding sucrose containing foods, foods with added sugars, and replacing refined grain product with high fiber alternatives.[71] [72]	Low sucrose diets have been shown to reduce symptoms.[73] [74] [75] [76] Congenital sucrase-isomaltase deficiency may also masquerade as adult IBS and respond to diet.[77]	Sucrase-isomaltase gene variants	Predict a moderately better response to a low sucrose in IBS-D.[78] May predict poor response to a LFD.[79] [80] Positive test does not rule out congenital deficiency as not all gene variants have been identified.[81]
Specific carbohydrate diet	The SCD restricts grains, refined sugars except for honey, processed foods, and most milk products except for fully fermented yogurt and some hard cheeses.[82]	The SCD has primarily been studied in IBD.[83] A clinical trial found no significant improvement in IBS symptoms with a SCD.[84]	N/A	N/A
Low nickel diet	The low nickel diet was constructed to manage adverse reactions to nickel containing foods and restricts foods high in nickel such as oats, almonds, chickpeas, tomato, cocoa, peanuts, walnuts and many others.[85]	A low nickel diet improves gastrointestinal symptoms in patients with nickel sensitivity and IBS or IBS-like symptoms. [86] [87] [88] [89] [90]	Oral mucosa patch test	The oral mucosa patch test complements clinical diagnosis of nickel sensitivity and predicts treatment response.[91]
Microbiome-targeted diet	Targeting the gut microbiota with dietary changes such as improving dietary quality,[92] increasing intake of fermented foods,[93] polyphenol rich foods,[94] and reduction of artificial food	Intervention studies have found symptom reductions with polyphenol rich food (blueberries),[96] fermented foods (sauerkraut, kimchi),[97] [98] and elimination of artificial sweeteners,[99] and	Microbiome	Microbiome testing-based dietary advice is limited by considerable inter-individual variability and lack of evidence linking microbiota signatures to disease phenotypes and treatment responses.[102] [103] [104]

	additives [95] has been proposed but lacks a defined dietary approach.	monosodium glutamate.[100] A traditional Mediterranean diet showed comparative efficacy to an LFD or GFD.[101]		
Ayurvedic diet	Ayurvedic nutritional therapy based on general concepts to support digestive health including warm food, regular timings of meals, and foods which are generally light on digestion but nourishing with additional personalization based on symptoms.	Personalised Ayurvedic nutritional therapy was as effective as a traditional diet and LFD. [105]	N/A	N/A

Key: Gluten free diet, GFD; Low fermentable oligosaccharides, disaccharides, monosaccharides, and polyols (FODMAP) diet, LFD; Confocal laser endomicroscopy, CLE; Specific carbohydrate diet, SCD; irritable bowel syndrome, IBS; diarrhoea predominant irritable bowel syndrome, IBS-D; Inflammatory bowel disease, IBD; Diamine oxidase, DAO; Gastrointestinal, GI; Small intestinal bacterial overgrowth, SIBO.

[1] NICE. Irritable bowel syndrome in adults: diagnosis and management. Clinical guideline. Published: 23 February 2008 Last updated: 04 April 2017.
[2] McKenzie YA, Bowyer RK, Leach H, et al. British Dietetic Association systematic review and evidence-based practice guidelines for the dietary management of irritable bowel syndrome in adults (2016 update). J Hum Nutr Diet. 2016 Oct;29(5):549-75.
[3] Rej A, Avery A, Aziz I, Black CJ, Bowyer RK, Buckle RL, Seamark L, Shaw CC, Thompson J, Trott N, Williams M, Sanders DS. Diet and irritable bowel syndrome: an update from a UK consensus meeting. BMC Med. 2022 Sep 13;20(1):287.
[4] Whelan K, Martin LD, Staudacher HM, Lomer MCE. The low FODMAP diet in the management of irritable bowel syndrome: an evidence-based review of FODMAP restriction, reintroduction and personalisation in clinical practice. J Hum Nutr Diet. 2018 Apr;31(2):239-255.
[5] Black CJ, Staudacher HM, Ford AC. Efficacy of a low FODMAP diet in irritable bowel syndrome: systematic review and network meta-analysis. Gut. 2022 Jun;71(6):1117-1126.
[6] Colomier E, Van Oudenhove L, Tack J, Böhn L, Bennet S, Nybacka S, Störsrud S, Öhman L, Törnblom H, Simrén M. Predictors of Symptom-Specific Treatment Response to Dietary Interventions in Irritable Bowel Syndrome. Nutrients. 2022 Jan 17;14(2):397.

[7] Vervier K, Moss S, Kumar N, Adoum A, Barne M, Browne H, Kaser A, Kiely CJ, Neville BA, Powell N, Raine T, Stares MD, Zhu A, De La Revilla Negro J, Lawley TD, Parkes M. Two microbiota subtypes identified in irritable bowel syndrome with distinct responses to the low FODMAP diet. Gut. 2022 Sep;71(9):1821-1830.

[8] Valeur J, Småstuen MC, Knudsen T, Lied GA, Røseth AG. Exploring Gut Microbiota Composition as an Indicator of Clinical Response to Dietary FODMAP Restriction in Patients with Irritable Bowel Syndrome. Dig Dis Sci. 2018 Feb;63(2):429-436.

[9] Bennet SMP, Böhn L, Störsrud S, Liljebo T, Collin L, Lindfors P, Törnblom H, Öhman L, Simrén M. Multivariate modelling of faecal bacterial profiles of patients with IBS predicts responsiveness to a diet low in FODMAPs. Gut. 2018 May;67(5):872-881.

[10] Chumpitazi BP, Cope JL, Hollister EB, Tsai CM, McMeans AR, Luna RA, Versalovic J, Shulman RJ. Randomised clinical trial: gut microbiome biomarkers are associated with clinical response to a low FODMAP diet in children with the irritable bowel syndrome. Aliment Pharmacol Ther. 2015 Aug;42(4):418-27.

[11] Wilson B, Kanno T, Slater R, Rossi M, Irving PM, Lomer MC, Probert C, Mason AJ, Whelan K. Faecal and urine metabolites, but not gut microbiota, may predict response to low FODMAP diet in irritable bowel syndrome. Aliment Pharmacol Ther. 2023 Aug;58(4):404-416.

[12] Rossi M, Aggio R, Staudacher HM, Lomer MC, Lindsay JO, Irving P, Probert C, Whelan K. Volatile Organic Compounds in Feces Associate With Response to Dietary Intervention in Patients With Irritable Bowel Syndrome. Clin Gastroenterol Hepatol. 2018 Mar;16(3):385-391.e1.

[13] Wilson B, Kanno T, Slater R, Rossi M, Irving PM, Lomer MC, Probert C, Mason AJ, Whelan K. Faecal and urine metabolites, but not gut microbiota, may predict response to low FODMAP diet in irritable bowel syndrome. Aliment Pharmacol Ther. 2023 Aug;58(4):404-416.

[14] Catassi C, Elli L, Bonaz B, et al A. Diagnosis of Non-Celiac Gluten Sensitivity (NCGS): The Salerno Experts' Criteria. Nutrients. 2015 Jun 18;7(6):4966-77. doi: 10.3390/nu7064966.

[15] Biesiekierski JR, Newnham ED, Irving PM, Barrett JS, Haines M, Doecke JD, et al. Gluten causes gastrointestinal symptoms in subjects without celiac disease: A double-blind randomized placebo-controlled trial. *Am J Gastroenterol.* (2011) 106:508–14.

[16] Shahbazkhani B, Sadeghi A, Malekzadeh R, Khatavi F, Etemadi M, Kalantri E, et al. Non-celiac gluten sensitivity has narrowed the spectrum of irritable bowel syndrome: A double-blind randomized placebo-controlled trial. *Nutrients.* (2015) 7:4542–54.

[17] Di Sabatino A, Volta U, Salvatore C, Biancheri P, Caio G, De Giorgio R, et al. Small amounts of gluten in subjects with suspected nonceliac gluten sensitivity: A randomized, double-blind, placebo-controlled, cross-over trial. *Clin Gastroenterol Hepatol.* (2015) 13:1604.e–12.e.

[18] Dhoble P, Abraham P, Desai D, Joshi A, Gupta T, Doctor S, Deshpande A, Basavanna R. Self-reported Wheat Sensitivity in Irritable Bowel Syndrome and Healthy Subjects: Prevalence of Celiac Markers and Response to Wheat-free Diet. J Neurogastroenterol Motil. 2021 Oct 30;27(4):596-601.

[19] Algera JP, Magnusson MK, Öhman L, Störsrud S, Simrén M, Törnblom H. Randomised controlled trial: effects of gluten-free diet on symptoms and the gut microenvironment in irritable bowel syndrome. Aliment Pharmacol Ther. 2022 Nov;56(9):1318-1327.

[20] Paduano D, Cingolani A, Tanda E, Usai P. Effect of Three Diets (Low-FODMAP, Gluten-free and Balanced) on Irritable Bowel Syndrome Symptoms and Health-Related Quality of Life. Nutrients. 2019 Jul 11;11(7):1566.

[21] Aziz I, Trott N, Briggs R, North JR, Hadjivassiliou M, Sanders DS. Efficacy of a Gluten-Free Diet in Subjects With Irritable Bowel Syndrome-Diarrhea Unaware of Their HLA-DQ2/8 Genotype. Clin Gastroenterol Hepatol. 2016 May;14(5):696-703.e1..

[22] Sapone A, Bai JC, Ciacci C, Dolinsek J, Green PH, Hadjivassiliou M, Kaukinen K, Rostami K, Sanders DS, Schumann M, Ullrich R, Villalta D, Volta U, Catassi C, Fasano A. Spectrum of gluten-related disorders: consensus on new nomenclature and classification. BMC Med. 2012 Feb 7;10:13.

[23] Pinto-Sanchez MI, Nardelli A, Borojevic R, De Palma G, Calo NC, McCarville J, Caminero A, Basra D, Mordhorst A, Ignatova E, Hansen S, Uhde M, Norman GL, Murray JA, Smecuol E, Armstrong D, Bai JC, Schuppan D, Collins SM, Alaedini A, Moayyedi P, Verdu EF, Bercik P. Gluten-Free Diet Reduces Symptoms, Particularly Diarrhea, in Patients With Irritable Bowel Syndrome and Antigliadin IgG. Clin Gastroenterol Hepatol. 2021 Nov;19(11):2343-2352.e8.

[24] Bojarski C, Tangermann P, Barmeyer C, Buchkremer J, Kiesslich R, Ellrichmann M, Schreiber S, Schmidt C, Stallmach A, Roehle R, Loddenkemper C, Daum S, Siegmund B, Schumann M, Ullrich R. Prospective, double-blind diagnostic multicentre study of confocal laser endomicroscopy for wheat sensitivity in patients with irritable bowel syndrome. Gut. 2022 Aug;71(8):1567-1576.

[25] Mayerhofer C, Kavallar AM, Aldrian D, Lindner AK, Müller T, Vogel GF. Efficacy of Elimination Diets in Eosinophilic Esophagitis: A Systematic Review and Meta-analysis. Clin Gastroenterol Hepatol. 2023 Aug;21(9):2197-2210.e3.

[26] Aparna Natarajan and Deanna M. Minich. Challenging Case in Clinical Practice: Use of an Elimination Diet for Resolution of Chronic Musculoskeletal Joint Pain.Alternative and Complementary Therapies. Feb 2019.12-19.

[27] Kirsten Chesney and Deanna M. Minich. Challenging Case in Clinical Practice: Use of the Elimination Diet as a Broad-Spectrum Approach for the First-Line Treatment of a Multi-Symptomatic Client. Alternative and Complementary Therapies. Apr 2019.72-76.

[28] Jennifer C. Brand and Deanna M. Minich. Challenging Case in Clinical Practice: Relief from Reported Severe, Chronic Constipation After Implementation of an Elimination Diet.Alternative and Complementary Therapies. Dec 2018.253-259.

[29] Hunter, JO. Solve Your Food Intolerance: A practical dietary programme to eliminate food intolerance. Vermilion; Revised edition. 2005.

[30] Mullin GE, Swift KM, Lipski L, Turnbull LK, Rampertab SD. Testing for food reactions: the good, the bad, and the ugly. Nutr Clin Pract. 2010 Apr;25(2):192-8.

[31] Parker TJ, Naylor SJ, Riordan AM, Hunter JO. Management of patients with food intolerance in irritable bowel syndrome: the development and use of an exclusion diet. *Journal of Human Nutrition and Dietetics*. 1995;8:159-166.

[32] King TS, Elia M, Hunter JO. Abnormal colonic fermentation in irritable bowel syndrome. Lancet. 1998 Oct 10;352(9135):1187-9.

[33] Bentley SJ, Pearson DJ, Rix KJ. Food hypersensitivity in irritable bowel syndrome. Lancet. 1983 Aug 6;2(8345):295-7.

[34] Jones VA, McLaughlan P, Shorthouse M, Workman E, Hunter JO. Food intolerance: a major factor in the pathogenesis of irritable bowel syndrome. Lancet. 1982 Nov 20;2(8308):1115-7.

[35] Singh R, Salem A, Nanavati J, Mullin GE. The Role of Diet in the Treatment of Irritable Bowel Syndrome: A Systematic Review. Gastroenterol Clin North Am. 2018 Mar;47(1):107-137.

[36] Ostrowska L, Wasiluk D, Lieners CFJ, Gałęcka M, Bartnicka A, Tveiten D. Igg Food Antibody Guided Elimination-Rotation Diet Was More Effective than FODMAP Diet and Control Diet in the Treatment of Women with Mixed IBS-Results from an Open Label Study. J Clin Med. 2021 Sep 23;10(19):4317.

[37] Atkinson, W.; Sheldon, T.A.; Shaath, N.; Whorwell, P.J. Food elimination based on IgG antibodies in irritable bowel syndrome: A randomised controlled trial. *Gut* 2004, *53*, 1459–1464.

[38] Zar, S.; Mincher, L.; Benson, M.J.; Kumar, D. Food-specific IgG4 antibody-guided exclusion diet improves symptoms and rectal compliance in irritable bowel syndrome. *Scand. J. Gastroenterol.* 2005, *40*, 800–807.

[39] Drisko, J.; Bischoff, B.; Hall, M.; McCallum, R. Treating irritable bowel syndrome with a food elimination diet followed by food challenge and probiotics. *J. Am. Coll. Nutr.* 2006, *25*, 514–522.

[40] Yang, C.M.; Li, Y.Q. The therapeutic effects of eliminating allergic foods according to food-specific IgG antibodies in irritable bowel syndrome. *Zhonghua Nei Ke Za Zhi* 2007, *46*, 641–643. (In Chinese)

[41] Guo, H.; Jiang, T.; Wang, J.; Chang, Y.; Guo, H.; Zhang, W. The value of eliminating foods according to food-specific immunoglobulin G antibodies in irritable bowel syndrome with diarrhoea. *J. Int. Med. Res.* 2012, *40*, 204–210.

[42] Aydinlar, E.I.; Dikmen, P.Y.; Tiftikci, A.; Saruc, M.; Aksu, M.; Gunsoy, H.G.; Tozun, N. IgG-based elimination diet in migraine plus irritable bowel syndrome. *Headache* 2013, *53*, 514–525.

[43] Cappelletti M, Tognon E, Vona L, Basello K, Costanzi A, Speciani MC, Speciani AF. Food-specific serum IgG and symptom reduction with a personalized, unrestricted-calorie diet of six weeks in Irritable Bowel Syndrome (IBS). Nutr Metab (Lond). 2020 Dec 1;17(1):101.
[44] Fritscher-Ravens A, Schuppan D, Ellrichmann M, Schoch S, Röcken C, Brasch J, Bethge J, Böttner M, Klose J, Milla PJ. Confocal endomicroscopy shows food-associated changes in the intestinal mucosa of patients with irritable bowel syndrome. Gastroenterology. 2014 Nov;147(5):1012-20.e4.
[45] Fritscher-Ravens A, Pflaum T, Mösinger M, Ruchay Z, Röcken C, Milla PJ, Das M, Böttner M, Wedel T, Schuppan D. Many Patients With Irritable Bowel Syndrome Have Atypical Food Allergies Not Associated With Immunoglobulin E. Gastroenterology. 2019 Jul;157(1):109-118.e5.
[46] Gjini B, Melchior I, Euler P, Kreysel C, Kalde S, Krummen B, Kiesslich R, Hemmerlein B, Frieling T. Food intolerance in patients with functional abdominal pain: Evaluation through endoscopic confocal laser endomicroscopy. Endosc Int Open. 2023 Jan 13;11(1):E67-E71.
[47] Bojarski C, Tangermann P, Barmeyer C, Buchkremer J, Kiesslich R, Ellrichmann M, Schreiber S, Schmidt C, Stallmach A, Roehle R, Loddenkemper C, Daum S, Siegmund B, Schumann M, Ullrich R. Prospective, double-blind diagnostic multicentre study of confocal laser endomicroscopy for wheat sensitivity in patients with irritable bowel syndrome. Gut. 2022 Aug;71(8):1567-1576.
[48] Ali A, Weiss TR, McKee D, Scherban A, Khan S, Fields MR, Apollo D, Mehal WZ. Efficacy of individualised diets in patients with irritable bowel syndrome: a randomised controlled trial. BMJ Open Gastroenterol. 2017 Sep 20;4(1):e000164.
[49] Zarini GG, McLean MA, Delgado SI. Is Personalized Dietary Therapy Effective for Individuals With Irritable Bowel Syndrome? Am J Lifestyle Med. 2022 Jul 6;17(2):317-325.
[50] Aziz I, Törnblom H, Simrén M. Small intestinal bacterial overgrowth as a cause for irritable bowel syndrome: guilty or not guilty? Curr Opin Gastroenterol. 2017 May;33(3):196-202.
[51] Pimentel M, Saad RJ, Long MD, Rao SSC. ACG Clinical Guideline: Small Intestinal Bacterial Overgrowth. Am J Gastroenterol. 2020 Feb;115(2):165-178.
[52] Wright CP, Dooley MT and Leeson H: Eradication of small intestinal bacterial overgrowth in irritable bowel syndrome using herbal therapy: A case report. Int J Funct Nutr 2: 13, 2021
[53] Pimentel M, Constantino T, Kong Y, Bajwa M, Rezaei A, Park S. A 14-day elemental diet is highly effective in normalizing the lactulose breath test. Dig Dis Sci. 2004 Jan;49(1):73-7.
[54] Aziz I, Törnblom H, Simrén M. Small intestinal bacterial overgrowth as a cause for irritable bowel syndrome: guilty or not guilty?. Curr Opin Gastroenterol. 2017;33(3):196-202. doi:10.1097/MOG.0000000000000348
[55] Wielgosz-Grochowska JP, Domanski N, Drywień ME. Efficacy of an Irritable Bowel Syndrome Diet in the Treatment of Small Intestinal Bacterial Overgrowth: A Narrative Review. Nutrients. 2022 Aug 17;14(16):3382.
[56] Comas-Basté O, Sánchez-Pérez S, Veciana-Nogués MT, Latorre-Moratalla M, Vidal-Carou MDC. Histamine Intolerance: The Current State of the Art. Biomolecules. 2020 Aug 14;10(8):1181.
[57] Schnedl WJ, Lackner S, Enko D, Schenk M, Holasek SJ, Mangge H. Evaluation of symptoms and symptom combinations in histamine intolerance. Intest Res. 2019 Jul;17(3):427-433.
[58] Schnedl WJ, Enko D. Considering histamine in functional gastrointestinal disorders. Crit Rev Food Sci Nutr. 2021;61(17):2960-2967.
[59] Lackner S, Malcher V, Enko D, Mangge H, Holasek SJ, Schnedl WJ. Histamine-reduced diet and increase of serum diamine oxidase correlating to diet compliance in histamine intolerance. Eur J Clin Nutr. 2019 Jan;73(1):102-104.
[60] Schnedl WJ, Schenk M, Lackner S, Enko D, Mangge H, Forster F. Diamine oxidase supplementation improves symptoms in patients with histamine intolerance. Food Sci Biotechnol. 2019 May 24;28(6):1779-1784.

[61] De Palma G, Shimbori C, Reed DE, Yu Y, Rabbia V, Lu J, Jimenez-Vargas N, Sessenwein J, Lopez-Lopez C, Pigrau M, Jaramillo-Polanco J, Zhang Y, Baerg L, Manzar A, Pujo J, Bai X, Pinto-Sanchez MI, Caminero A, Madsen K, Surette MG, Beyak M, Lomax AE, Verdu EF, Collins SM, Vanner SJ, Bercik P. Histamine production by the gut microbiota induces visceral hyperalgesia through histamine 4 receptor signaling in mice. Sci Transl Med. 2022 Jul 27;14(655):eabj1895.
[62] McIntosh K, Reed DE, Schneider T, Dang F, Keshteli AH, De Palma G, Madsen K, Bercik P, Vanner S. FODMAPs alter symptoms and the metabolome of patients with IBS: a randomised controlled trial. Gut. 2017 Jul;66(7):1241-1251. doi: 10.1136/gutjnl-2015-311339. Epub 2016 Mar 14. Erratum in: Gut. 2019 Jul;68(7):1342. PMID: 26976734.
[63] Reese I, Ballmer-Weber B, Beyer K, et al. Guideline on management of suspected adverse reactions to ingested histamine: Guideline of the German Society for Allergology and Clinical Immunology (DGAKI), the Society for Pediatric Allergology and Environmental Medicine (GPA), the Medical Association of German Allergologists (AeDA) as well as the Swiss Society for Allergology and Immunology (SGAI) and the Austrian Society for Allergology and Immunology (ÖGAI). Allergol Select. 2021 Oct 5;5:305-314.
[64] van Odijk J, Weisheit A, Arvidsson M, Miron N, Nwaru B, Ekerljung L. The Use of DAO as a Marker for Histamine Intolerance: Measurements and Determinants in a Large Random Population-Based Survey. Nutrients. 2023 Jun 26;15(13):2887.
[65] Hrubisko M, Danis R, Huorka M, Wawruch M. Histamine Intolerance-The More We Know the Less We Know. A Review. Nutrients. 2021 Jun 29;13(7):2228.
[66] Mušič E, Korošec P, Šilar M, Adamič K, Košnik M, Rijavec M. Serum diamine oxidase activity as a diagnostic test for histamine intolerance. Wien Klin Wochenschr. 2013 May;125(9-10):239-43.
[67] Comas-Basté O, Latorre-Moratalla ML, Bernacchia R, Veciana-Nogués MT, Vidal-Carou MC. New approach for the diagnosis of histamine intolerance based on the determination of histamine and methylhistamine in urine. J Pharm Biomed Anal. 2017 Oct 25;145:379-385.
[68] Sánchez-Pérez S, Celorio-Sardà R, Veciana-Nogués MT, Latorre-Moratalla ML, Comas-Basté O, Vidal-Carou MC. 1-methylhistamine as a potential biomarker of food histamine intolerance. A pilot study. Front Nutr. 2022 Oct 12;9:973682.
[69] Tuck CJ, Biesiekierski JR, Schmid-Grendelmeier P, Pohl D. Food Intolerances. Nutrients. 2019 Jul 22;11(7):1684.
[70] Maintz L, Yu CF, Rodríguez E, Baurecht H, Bieber T, Illig T, Weidinger S, Novak N. Association of single nucleotide polymorphisms in the diamine oxidase gene with diamine oxidase serum activities. Allergy. 2011 Jul;66(7):893-902.
[71] Puntis JW, Zamvar V. Congenital sucrase-isomaltase deficiency: diagnostic challenges and response to enzyme replacement therapy. Arch Dis Child. 2015 Sep;100(9):869-71.
[72] Nilholm C, Larsson E, Sonestedt E, Roth B, Ohlsson B. Assessment of a 4-Week Starch- and Sucrose-Reduced Diet and Its Effects on Gastrointestinal Symptoms and Inflammatory Parameters among Patients with Irritable Bowel Syndrome. Nutrients. 2021 Jan 28;13(2):416.
[73] Nilholm C, Roth B, Ohlsson B. A Dietary Intervention with Reduction of Starch and Sucrose Leads to Reduced Gastrointestinal and Extra-Intestinal Symptoms in IBS Patients. Nutrients. 2019 Jul 20;11(7):1662.
[74] Kim SB, Calmet FH, Garrido J, Garcia-Buitrago MT, Moshiree B. Sucrase-Isomaltase Deficiency as a Potential Masquerader in Irritable Bowel Syndrome. Dig Dis Sci. 2020 Feb;65(2):534-540.
[75] Nilholm C, Larsson E, Sonestedt E, Roth B, Ohlsson B. Assessment of a 4-Week Starch- and Sucrose-Reduced Diet and Its Effects on Gastrointestinal Symptoms and Inflammatory Parameters among Patients with Irritable Bowel Syndrome. Nutrients. 2021 Jan 28;13(2):416.
[76] Gayoso L, Garcia-Etxebarria K, Arzallus T, Montalvo I, Lizasoain J, D'Amato M, Etxeberria U, Bujanda L. The effect of starch- and sucrose-reduced diet accompanied by nutritional and culinary recommendations on the symptoms of irritable bowel syndrome patients with diarrhoea. Therap Adv Gastroenterol. 2023 Apr 28;16:17562848231156682.
[77] Foley A, Halmos EP, Husein DM, Fehily SR, Löscher BS, Franke A, Naim HY, Gibson PR, D'Amato M. Adult sucrase-isomaltase deficiency masquerading as IBS. Gut. 2022 Jun;71(6):1237-1238.

[78] Zamfir-Taranu A, Löscher BS, Husein DM, et al. Sucrase-isomaltase genotype and response to a starch-reduced and sucrose-reduced diet in IBS-D patients. Gut. 2023 Mar 6:gutjnl-2023-329695. doi: 10.1136/gutjnl-2023-329695.
[79] Husein DM, Naim HY. Impaired cell surface expression and digestive function of sucrase-isomaltase gene variants are associated with reduced efficacy of low FODMAPs diet in patients with IBS-D. Gut. 2020 Aug;69(8):1538-1539.
[80] Zheng T, Eswaran S, Photenhauer AL, Merchant JL, Chey WD, D'Amato M. Reduced efficacy of low FODMAPs diet in patients with IBS-D carrying sucrase-isomaltase (*SI*) hypomorphic variants. Gut. 2020 Feb;69(2):397-398.
[81] Chey WD, Cash B, Lembo A, et al. Congenital sucrase-isomaltase deficiency: what, when, and how? Gastroenterol Hepatol 2020;16(10):1-11.
[82] Suskind DL, Lee D, Kim YM, Wahbeh G, Singh N, Braly K, Nuding M, Nicora CD, Purvine SO, Lipton MS, Jansson JK, Nelson WC. The Specific Carbohydrate Diet and Diet Modification as Induction Therapy for Pediatric Crohn's Disease: A Randomized Diet Controlled Trial. Nutrients. 2020 Dec 6;12(12):3749.
[83] Reznikov EA, Suskind DL. Current Nutritional Therapies in Inflammatory Bowel Disease: Improving Clinical Remission Rates and Sustainability of Long-Term Dietary Therapies. Nutrients. 2023 Jan 28;15(3):668.
[84] Vincenzi M, Del Ciondolo I, Pasquini E, Gennai K, Paolini B. Effects of a Low FODMAP Diet and Specific Carbohydrate Diet on Symptoms and Nutritional Adequacy of Patients with Irritable Bowel Syndrome: Preliminary Results of a Single-blinded Randomized Trial. J Transl Int Med. 2017 Jun 30;5(2):120-126.
[85] Greco N, Pisano A, Mezzatesta L, Pettinelli M, Meacci A, Pignataro MG, Giordano C, Picarelli A. New Insights and Evidence on "Food Intolerances": Non-Celiac Gluten Sensitivity and Nickel Allergic Contact Mucositis. Nutrients. 2023 May 17;15(10):2353.
[86] Rizzi A, Nucera E, Laterza L, Gaetani E, Valenza V, Corbo GM, Inchingolo R, Buonomo A, Schiavino D, Gasbarrini A. Irritable Bowel Syndrome and Nickel Allergy: What Is the Role of the Low Nickel Diet? J Neurogastroenterol Motil. 2017 Jan 30;23(1):101-108.
[87] Borghini R, Porpora MG, Casale R, Marino M, Palmieri E, Greco N, Donato G, Picarelli A. Irritable Bowel Syndrome-Like Disorders in Endometriosis: Prevalence of Nickel Sensitivity and Effects of a Low-Nickel Diet. An Open-Label Pilot Study. Nutrients. 2020 Jan 28;12(2):341.
[88] Caruso C, Colantuono S, Celi G, Salerno L, De Martino G, Ianiro G, Casale C, Nucera E, Del Giacco S, Gasbarrini A. Modulation of gut microbiota in patients with IBS and systemic nickel allergy after diet and probiotic supplementation: a pilot study. J Biol Regul Homeost Agents. 2020 Sep-Oct,;34(5):1929-1934.
[89] Borghini R, De Amicis N, Bella A, Greco N, Donato G, Picarelli A. Beneficial Effects of a Low-Nickel Diet on Relapsing IBS-Like and Extraintestinal Symptoms of Celiac Patients during a Proper Gluten-Free Diet: Nickel Allergic Contact Mucositis in Suspected Non-Responsive Celiac Disease. Nutrients. 2020 Jul 29;12(8):2277.
[90] Mori H, Hayashi S, Mori S, Ikegami T, Saito Y, Yamauchi A, Okamoto M, Hamasaki Y, Igawa K. A case of systemic nickel allergy with diarrhea-predominant irritable bowel syndrome in which nickel intake restriction and administration of a probiotic formulation were effective. Allergol Int. 2021 Oct;70(4):515-516.
[91] Picarelli A, Di Tola M, Vallecoccia A, Libanori V, Magrelli M, Carlesimo M, Rossi A. Oral mucosa patch test: a new tool to recognize and study the adverse effects of dietary nickel exposure. Biol Trace Elem Res. 2011 Feb;139(2):151-9. doi: 10.1007/s12011-010-8652-y.
[92] Dale HF, Lorentzen SCS, Mellin-Olsen T, Valeur J. Diet-microbiota interaction in irritable bowel syndrome: looking beyond the low-FODMAP approach. Scand J Gastroenterol. 2023 Jun 29:1-12.
[93] Garnås E. Fermented Vegetables as a Potential Treatment for Irritable Bowel Syndrome. Curr Dev Nutr. 2023 Feb 18;7(3):100039.
[94] Hagan M, Hayee BH, Rodriguez-Mateos A. (Poly)phenols in Inflammatory Bowel Disease and Irritable Bowel Syndrome: A Review. Molecules. 2021 Mar 25;26(7):1843.
[95] Rinninella E, Cintoni M, Raoul P, Gasbarrini A, Mele MC. Food Additives, Gut Microbiota, and Irritable Bowel Syndrome: A Hidden Track. Int J Environ Res Public Health. 2020 Nov 27;17(23):8816.
[96] Wilder-Smith CH, Materna A, Olesen SS. Blueberries Improve Abdominal Symptoms, Well-Being and Functioning in Patients with Functional Gastrointestinal Disorders. Nutrients. 2023 May 20;15(10):2396.

[97] Nielsen ES , Garnås E , Jensen KJ , Hansen LH , Olsen PS , Ritz C , Krych L , Nielsen DS . Lacto-fermented sauerkraut improves symptoms in IBS patients independent of product pasteurisation - a pilot study. Food Funct. 2018 Oct 17;9(10):5323-5335.

[98] Kim HY, Park ES, Choi YS, Park SJ, Kim JH, Chang HK, Park KY. Kimchi improves irritable bowel syndrome: results of a randomized, double-blind placebo-controlled study. Food Nutr Res. 2022 May 23;66.

[99] Mendoza-Martínez VM, Zavala-Solares MR, Espinosa-Flores AJ, León-Barrera KL, Alcántara-Suárez R, Carrillo-Ruíz JD, Escobedo G, Roldan-Valadez E, Esquivel-Velázquez M, Meléndez-Mier G, Bueno-Hernández N. Is a Non-Caloric Sweetener-Free Diet Good to Treat Functional Gastrointestinal Disorder Symptoms? A Randomized Controlled Trial. Nutrients. 2022 Mar 5;14(5):1095.

[100] Holton KF, Taren DL, Thomson CA, Bennett RM, Jones KD. The effect of dietary glutamate on fibromyalgia and irritable bowel symptoms. Clin Exp Rheumatol. 2012 Nov-Dec;30(6 Suppl 74):10-7.

[101] Paduano D, Cingolani A, Tanda E, Usai P. Effect of Three Diets (Low-FODMAP, Gluten-free and Balanced) on Irritable Bowel Syndrome Symptoms and Health-Related Quality of Life. Nutrients. 2019 Jul 11;11(7):1566.

[102] Mills S, Lane JA, Smith GJ, Grimaldi KA, Ross RP, Stanton C. Precision Nutrition and the Microbiome Part II: Potential Opportunities and Pathways to Commercialisation. Nutrients. 2019 Jun 27;11(7):1468.

[103] Liu Z, de Vries B, Gerritsen J, Smidt H, Zoetendal EG. Microbiome-based stratification to guide dietary interventions to improve human health. Nutr Res. 2020 Oct;82:1-10.

[104] Camilleri M, Boeckxstaens G. Irritable bowel syndrome: treatment based on pathophysiology and biomarkers. Gut. 2023 Mar;72(3):590-599. doi: 10.1136/gutjnl-2022-328515.

[105] Jeitler M, Wottke T, Schumann D, Puerto Valencia LM, Michalsen A, Steckhan N, Mittwede M, Stapelfeldt E, Koppold-Liebscher D, Cramer H, Wischnewsky M, Murthy V, Kessler CS. Ayurvedic vs. Conventional Nutritional Therapy Including Low-FODMAP Diet for Patients With Irritable Bowel Syndrome-A Randomized Controlled Trial. Front Med (Lausanne). 2021 Sep 6;8:622029.