

World Journal of *Gastroenterology*

World J Gastroenterol 2019 June 28; 25(24): 2973-3107



**OPINION REVIEW**

- 2973** Dietary Lectin exclusion: The next big food trend?
Panacer K, Whorwell PJ

REVIEW

- 2977** Immunotherapy for hepatocellular carcinoma: Current and future
Johnston MP, Khakoo SI
- 2990** Application of Big Data analysis in gastrointestinal research
Cheung KS, Leung WK, Seto WK

MINIREVIEWS

- 3009** Biomarkers and subtypes of deranged lipid metabolism in non-alcoholic fatty liver disease
Mato JM, Alonso C, Nouredin M, Lu SC
- 3021** Imaging biomarkers for the treatment of esophageal cancer
Hayano K, Ohira G, Hirata A, Aoyagi T, Imanishi S, Tochigi T, Hanaoka T, Shuto K, Matsubara H

ORIGINAL ARTICLE**Basic Study**

- 3030** Development and *in vitro* study of a bi-specific magnetic resonance imaging molecular probe for hepatocellular carcinoma
Ma XH, Wang S, Liu SY, Chen K, Wu ZY, Li DF, Mi YT, Hu LB, Chen ZW, Zhao XM
- 3044** Effect of NLRC5 on activation and reversion of hepatic stellate cells by regulating the nuclear factor- κ B signaling pathway
Zhang YZ, Yao JN, Zhang LF, Wang CF, Zhang XX, Gao B
- 3056** Freeze-dried Si-Ni-San powder can ameliorate high fat diet-induced non-alcoholic fatty liver disease
Zhu F, Li YM, Feng TT, Wu Y, Zhang HX, Jin GY, Liu JP

Retrospective Study

- 3069** Clinical characteristics of young patients with early Barrett's neoplasia
Iwaya Y, Shimamura Y, Goda K, Rodríguez de Santiago E, Coneys JG, Mosko JD, Kandel G, Kortan P, May G, Marcon N, Teshima C

Observational Study

- 3079** Evaluation of clinical outcomes in an interdisciplinary abdominal pain clinic: A retrospective, exploratory review
Deacy AD, Friesen CA, Staggs VS, Schurman JV

SYSTEMATIC REVIEWS

- 3091** Recent advances in endoscopic retrograde cholangiopancreatography in Billroth II gastrectomy patients: A systematic review
Park TY, Song TJ

ABOUT COVER

Editorial board member of *World Journal of Gastroenterology*, Vicente Lorenzo-Zúñiga, MD, PhD, Associate Professor, Chief Doctor, Senior Scientist, Staff Physician, Endoscopy Unit, Department of Gastroenterology, Hospital Universitari Germans Trias i Pujol/CIBERehd, Badalona 08916, Spain

AIMS AND SCOPE

World Journal of Gastroenterology (*World J Gastroenterol*, *WJG*, print ISSN 1007-9327, online ISSN 2219-2840, DOI: 10.3748) is a peer-reviewed open access journal. The *WJG* Editorial Board consists of 701 experts in gastroenterology and hepatology from 58 countries.

The primary task of *WJG* is to rapidly publish high-quality original articles, reviews, and commentaries in the fields of gastroenterology, hepatology, gastrointestinal endoscopy, gastrointestinal surgery, hepatobiliary surgery, gastrointestinal oncology, gastrointestinal radiation oncology, etc. The *WJG* is dedicated to become an influential and prestigious journal in gastroenterology and hepatology, to promote the development of above disciplines, and to improve the diagnostic and therapeutic skill and expertise of clinicians.

INDEXING/ABSTRACTING

The *WJG* is now indexed in Current Contents®/Clinical Medicine, Science Citation Index Expanded (also known as SciSearch®), Journal Citation Reports®, Index Medicus, MEDLINE, PubMed, PubMed Central, and Scopus. The 2019 edition of Journal Citation Report® cites the 2018 impact factor for *WJG* as 3.411 (5-year impact factor: 3.579), ranking *WJG* as 35th among 84 journals in gastroenterology and hepatology (quartile in category Q2). CiteScore (2018): 3.43.

RESPONSIBLE EDITORS FOR THIS ISSUE

Responsible Electronic Editor: Yan-Liang Zhang

Proofing Production Department Director: Yun-Xiaojian Wu

NAME OF JOURNAL

World Journal of Gastroenterology

ISSN

ISSN 1007-9327 (print) ISSN 2219-2840 (online)

LAUNCH DATE

October 1, 1995

FREQUENCY

Weekly

EDITORS-IN-CHIEF

Subrata Ghosh, Andrzej S. Tarnawski

EDITORIAL BOARD MEMBERS

<http://www.wjgnet.com/1007-9327/editorialboard.htm>

EDITORIAL OFFICE

Ze-Mao Gong, Director

PUBLICATION DATE

June 28, 2019

COPYRIGHT

© 2019 Baishideng Publishing Group Inc

INSTRUCTIONS TO AUTHORS

<https://www.wjgnet.com/bpg/gerinfo/204>

GUIDELINES FOR ETHICS DOCUMENTS

<https://www.wjgnet.com/bpg/GerInfo/287>

GUIDELINES FOR NON-NATIVE SPEAKERS OF ENGLISH

<https://www.wjgnet.com/bpg/gerinfo/240>

PUBLICATION MISCONDUCT

<https://www.wjgnet.com/bpg/gerinfo/208>

ARTICLE PROCESSING CHARGE

<https://www.wjgnet.com/bpg/gerinfo/242>

STEPS FOR SUBMITTING MANUSCRIPTS

<https://www.wjgnet.com/bpg/GerInfo/239>

ONLINE SUBMISSION

<https://www.f6publishing.com>



Dietary Lectin exclusion: The next big food trend?

Kirpal Panacer, Peter J Whorwell

ORCID number: Kirpal Panacer (0000-0001-8632-9090); Peter J Whorwell (0000-0002-5220-8474).

Author contributions: Whorwell PJ conceived the idea; and Panacer K and Whorwell PJ searched the literature; Panacer K wrote an initial draft of the paper which was then edited by Whorwell PJ until both authors approved the final draft.

Conflict-of-interest statement: KP has no conflicts of interest. Over the last 3 years PJW has acted as a consultant to or received research funding from Danone, Allergan Pharma, Ironwood Pharma and Salix Pharma but it is not felt that the contents of this viewpoint have been influenced at all by any of these relationships.

Open-Access: This article is an open-access article which was selected by an in-house editor and fully peer-reviewed by external reviewers. It is distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>

Manuscript source: Invited manuscript

Received: January 16, 2019

Peer-review started: January 16, 2019

First decision: March 27, 2019

Revised: April 15, 2019

Kirpal Panacer, University of Manchester Medical Student, Stopford Building, University of Manchester, Manchester M13 9PG, United Kingdom

Peter J Whorwell, Neurogastroenterology Unit, Wythenshawe Hospital, Manchester M23 9LT, United Kingdom

Corresponding author: Peter J Whorwell, BSc, FRCP (Hon), MBBS, MD, PhD, Full Professor, Neurogastroenterology Unit, Wythenshawe Hospital, Southmoor Road, Manchester M23 9LT, United Kingdom. peter.whorwell@mft.nhs.uk

Telephone: +44-1612914177

Fax: +44-1612912611

Abstract

Until recently, with the exception of coeliac disease, gastroenterologists have not been particularly interested in the role of diet in the management of gastrointestinal disorders. However, patients have always felt that diet must play a part in their symptoms and, in the absence of any medical interest, have turned to alternative dietary practitioners for help, which can often have no evidence base. Fortunately, with the advent of the FODMAP diet (fermentable oligosaccharides, disaccharides, monosaccharides, and polyols) and the realisation that diet can have a profound effect on the microbiome, medical opinion is now changing. Nevertheless, research on the various diets that are now available is often completely lacking. Lectins are carbohydrate binding proteins which are widely distributed in nature and are found in a whole variety of commonly consumed foods. It seems likely that the exclusion of lectins from the diet could become the next "food fashion" for alternative practitioners to promote, especially as there is some evidence to suggest that certain lectins may be harmful to health. It is, therefore, the purpose of this viewpoint to try and stimulate research on the dietary effects of lectins, which is currently minimal, so that we can pre-empt a situation where we are unable to give patients or the public evidence based advice on this topic.

Key words: Dietary lectins; Exclusion diets; Gastrointestinal system; Harm; Carbohydrate

©The Author(s) 2019. Published by Baishideng Publishing Group Inc. All rights reserved.

Core tip: Patients with gastrointestinal problems, as well as the general public, are being offered an increasing number of different diets which claim to improve their health, often without any evidence to support a beneficial effect. Lectins are carbohydrate binding proteins which are found in many foods and some of them, such as those found in red kidney beans, can cause gastrointestinal symptoms if not cooked properly. Consequently,

Accepted: April 29, 2019
Article in press: April 29, 2019
Published online: June 28, 2019

P-Reviewer: Rath T
S-Editor: Yan JP
L-Editor: A
E-Editor: Zhang YL



it is possible that a lectin exclusion diet could become fashionable in the future and research is needed to find out under what circumstances, if any, such a diet may be advisable.

Citation: Panacer K, Whorwell PJ. Dietary Lectin exclusion: The next big food trend? *World J Gastroenterol* 2019; 25(24): 2973-2976

URL: <https://www.wjgnet.com/1007-9327/full/v25/i24/2973.htm>

DOI: <https://dx.doi.org/10.3748/wjg.v25.i24.2973>

INTRODUCTION

The majority of patients with gastrointestinal problems, especially those of a functional nature, consider that diet is important either in the cause of their symptoms or at least in their exacerbation. Unfortunately, until relatively recently the medical profession has largely ignored the role of diet in gastroenterology other than to advise patients to eat more fibre. However, in 1994 we showed that cereal fibre can actually exacerbate the symptoms of irritable bowel syndrome (IBS)^[1]. In addition, we also found that fruit and vegetables could cause problems and assumed that this was likely to be as a result of their fibre content^[1]. Despite these findings being published in the *Lancet*, this lack of interest in the contribution of diet to gastrointestinal health persisted with the void gradually being filled by alternative dietary practitioners as well as the marketing of a whole variety of tests for the detection of food allergies and intolerances. The proliferation of these alternative sources of advice coupled with the advent of the Internet may also partly explain why even healthy members of the general public have now become interested in the possible harmful effects of some dietary components. As a result of this, a bewildering array of diets are now fashionable.

GLUTEN

The exclusion of gluten is attracting particular attention. Obviously, the role of gluten in coeliac disease is beyond doubt but there is now interest in the possible effects of gluten in those individuals with the genetic predisposition to coeliac disease and even concepts such as non-coeliac gluten sensitivity^[2]. Furthermore, large numbers of apparently healthy individuals are now adopting a gluten free diet^[3]. Consequently, it is absolutely essential that the medical profession start undertaking good quality research on the role of gluten and other dietary components in health and disease so that the public can be given evidence based advice about their diet rather than having to trawl through questionable information on the Internet.

FODMAPs

Fortunately, the advent of the low FODMAP diet (fermentable oligosaccharides, disaccharides, monosaccharides, and polyols) for the treatment of IBS has at last galvanised interest in dietary interventions amongst the gastroenterology community and, hopefully, this will stimulate further research on other dietary interventions in both gastroenterology as well as other specialties. FODMAPs are carbohydrates that are poorly absorbed by the gut and are, therefore, fermented by bacteria. This leads to symptoms, especially in patients with IBS, possibly by exacerbating the gut hypersensitivity that exists in these patients^[4]. It seems likely that the detrimental effect of fruit and vegetables on symptoms of IBS that we previously reported is more likely to be due to FODMAPs rather than fibre as we surmised, although a dual effect may be a possibility. FODMAPs are contained in cereals, fruits, vegetables, and legumes as well as milk products and there is now reasonably good evidence that FODMAP restriction in IBS can improve symptoms^[5]. However, there are some concerns about whether this diet can lead to changes in the gut microbiota that may not be entirely desirable^[6]. Given the sometimes dramatic reduction in symptoms that can be seen in patients on a low FODMAP diet it is possible that, in the future, it might be tempting for even healthy individuals to experiment with this approach.

LECTINS

Lectins are carbohydrate binding proteins that are widely distributed in nature and occur in a variety of foods such as cereals, fruit, vegetables, animal products and fish^[6]. There is no universally accepted classification of lectins but they do have characteristics that differ from other proteins. Some lectins such as ricin, which is derived from the castor bean, are highly toxic with the ingestion of even miniscule quantities of ricin proving fatal whereas other lectins are relatively harmless^[7]. Lectins, such as phytohaemagglutinin and concanavalin A, agglutinate red cells and act as lymphocyte mitogens with these properties having been used in the laboratory for many years. Much of the research on the results of consuming lectins is relatively old and largely confined to the effect of plant lectins on animals where, for instance, they can survive transit through the gut and have a variety of local and systemic effects^[8-10]. Furthermore, in contrast to animal proteins, lectins are resistant to heat and even cooking can fail to inactivate them unless it is above 100 °C for as long as thirty minutes or more^[11]. Animal studies have shown that lectins, which have an affinity for gut epithelium, can interfere with absorption of nutrients with these effects sometimes being called “anti-nutritional”^[12,13]. For instance, phytohaemagglutinin, which is found in high concentrations in the red kidney bean, has a range of effects on the gut including decreased acid secretion, crypt hyperplasia, changes in the brush border and even an indirect effect on the pancreas and these effects on the gut are not confined to this particular lectin^[10,14-16]. There is also evidence that some lectins may affect the gut microbiota as well as having systemic effects such as the modulation of inflammation and immune function^[17,18]. It should be noted that these latter properties may not necessarily always be negative indicating that the therapeutic potential of some of these proteins might also be worth exploring.

Despite this evidence of the detrimental effects of lectins in animals, their potential to cause harm in humans has received surprisingly little scientific attention although “food poisoning” due to red kidney bean consumption has been reasonably well documented^[19]. However, much more needs to be known about which lectins are harmful and the effects of dose and duration of consumption. It is also interesting to note that many of the foods that are excluded in the low FODMAP diet are those that also contain lectins. This raises the possibility that it may not just be the FODMAPs that are causing problems in those who benefit from their exclusion.

CONCLUSION

As a result of their potential for toxicity and their “anti-nutritional effects” it is almost inevitable that lectin exclusion could well become a big food fad^[13]. Consequently, now is the time to resume research on this ubiquitous family of proteins so that we fully understand their role in health and disease. This would then enable us to advise our patients and the general public accordingly, rather than having to play “catch up” after everybody starts wondering whether they should be excluding some or adding others to their diet.

REFERENCES

- 1 **Francis CY**, Whorwell PJ. Bran and irritable bowel syndrome: Time for reappraisal. *Lancet* 1994; **344**: 39-40 [PMID: 7912305 DOI: 10.1016/s0140-6736(94)91055-3]
- 2 **Catassi C**, Alaedini A, Bojarski C, Bonaz B, Bouma G, Carroccio A, Castillejo G, De Magistris L, Dieterich W, Di Liberto D, Elli L, Fasano A, Hadjivassiliou M, Kurien M, Lionetti E, Mulder CJ, Rostami K, Sapone A, Scherf K, Schuppan D, Trott N, Volta U, Zavallos V, Zopf Y, Sanders DS. The Overlapping Area of Non-Celiac Gluten Sensitivity (NCGS) and Wheat-Sensitive Irritable Bowel Syndrome (IBS): An Update. *Nutrients* 2017; **9**: pii: E1268 [PMID: 29160841 DOI: 10.3390/nu9111268]
- 3 **Gaesser GA**, Angadi SS. Gluten-free diet: Imprudent dietary advice for the general population? *J Acad Nutr Diet* 2012; **112**: 1330-1333 [PMID: 22939437 DOI: 10.1016/j.jand.2012.06.009]
- 4 **Zhou SY**, Gilliland M, Wu X, Leelasinjaroen P, Zhang G, Zhou H, Ye B, Lu Y, Owyang C. FODMAP diet modulates visceral nociception by lipopolysaccharide-mediated intestinal inflammation and barrier dysfunction. *J Clin Invest* 2018; **128**: 267-280 [PMID: 29202473 DOI: 10.1172/JCI92390]
- 5 **Staudacher HM**, Whelan K. The low FODMAP diet: Recent advances in understanding its mechanisms and efficacy in IBS. *Gut* 2017; **66**: 1517-1527 [PMID: 28592442 DOI: 10.1136/gutjnl-2017-313750]
- 6 **Van Damme E**, Peumans W, Barre A, Rouge P. Plant Lectins: A composite of several distinct families of structurally and evolutionary related proteins with diverse biological roles. *Crit Rev Plant Sci* 1998; **17**: 575-692 [DOI: 10.1080/07352689891304276]
- 7 **Knight B**. Ricin--a potent homicidal poison. *Br Med J* 1979; **1**: 350-351 [PMID: 421122]
- 8 **Pusztai A**, Ewen SW, Grant G, Peumans WJ, van Damme EJ, Rubio L, Bardocz S. Relationship between survival and binding of plant lectins during small intestinal passage and their effectiveness as growth factors. *Digestion* 1990; **46** Suppl 2: 308-316 [PMID: 2262064 DOI: 10.1159/000200402]

- 9 **Kordás K**, Burghardt B, Kisfalvi K, Bardocz S, Pusztai A, Varga G. Diverse effects of phytohaemagglutinin on gastrointestinal secretions in rats. *J Physiol Paris* 2000; **94**: 31-36 [PMID: [10761686](#) DOI: [10.1016/S0928-4257\(99\)00106-0](#)]
- 10 **Bardocz S**, Grant G, Ewen SW, Duguid TJ, Brown DS, Englyst K, Pusztai A. Reversible effect of phytohaemagglutinin on the growth and metabolism of rat gastrointestinal tract. *Gut* 1995; **37**: 353-360 [PMID: [7590430](#) DOI: [10.1136/gut.37.3.353](#)]
- 11 **Pusztai A**, Grant G. Assessment of lectin inactivation by heat and digestion. *Methods Mol Med* 1998; **9**: 505-514 [PMID: [21374488](#) DOI: [10.1385/0-89603-396-1:505](#)]
- 12 **Kik MJ**, Rojer JM, Mouwen JM, Koninkx JF, van Dijk JE, van der Hage MH. The interaction between plant lectins and the small intestinal epithelium: A primary cause of intestinal disturbance. *Vet Q* 1989; **11**: 108-115 [PMID: [2662569](#) DOI: [10.1080/01652176.1989.9694207](#)]
- 13 **Vasconcelos IM**, Oliveira JT. Antinutritional properties of plant lectins. *Toxicon* 2004; **44**: 385-403 [PMID: [15302522](#) DOI: [10.1016/j.toxicon.2004.05.005](#)]
- 14 **Herzig KH**, Bardocz S, Grant G, Nustede R, Fölsch UR, Pusztai A. Red kidney bean lectin is a potent cholecystokinin releasing stimulus in the rat inducing pancreatic growth. *Gut* 1997; **41**: 333-338 [PMID: [9378388](#) DOI: [10.1136/gut.41.3.333](#)]
- 15 **Weinman MD**, Allan CH, Trier JS, Hagen SJ. Repair of microvilli in the rat small intestine after damage with lectins contained in the red kidney bean. *Gastroenterology* 1989; **97**: 1193-1204 [PMID: [2792657](#) DOI: [10.1016/0016-5085\(89\)91690-9](#)]
- 16 **Lorenzsonn V**, Olsen WA. In vivo responses of rat intestinal epithelium to intraluminal dietary lectins. *Gastroenterology* 1982; **82**: 838-848 [PMID: [6895878](#)]
- 17 **Banwell JG**, Boldt DH, Meyers J, Weber FL. Phytohemagglutinin derived from red kidney bean (*Phaseolus vulgaris*): A cause for intestinal malabsorption associated with bacterial overgrowth in the rat. *Gastroenterology* 1983; **84**: 506-515 [PMID: [6822324](#)]
- 18 **Gong T**, Wang X, Yang Y, Yan Y, Yu C, Zhou R, Jiang W. Plant Lectins Activate the NLRP3 Inflammasome To Promote Inflammatory Disorders. *J Immunol* 2017; **198**: 2082-2092 [PMID: [28087670](#) DOI: [10.4049/jimmunol.1600145](#)]
- 19 **Rodhouse JC**, Haugh CA, Roberts D, Gilbert RJ. Red kidney bean poisoning in the UK: An analysis of 50 suspected incidents between 1976 and 1989. *Epidemiol Infect* 1990; **105**: 485-491 [PMID: [2249712](#) DOI: [10.1017/S095026880004810X](#)]



Published By Baishideng Publishing Group Inc
7041 Koll Center Parkway, Suite 160, Pleasanton, CA 94566, USA
Telephone: +1-925-2238242
Fax: +1-925-2238243
E-mail: bpgoffice@wjgnet.com
Help Desk: <http://www.f6publishing.com/helpdesk>
<http://www.wjgnet.com>

