Response to COVID-19 and NCDs:
Unlocking nutritional tools for gut microbiota support and low blood glucose profiles

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connecting nutrition and health

Overview

- BENEO and the BENEO-Institute – a science-based organisation
- Glycaemia and immune health
- Introducing slow-release, low glycaemic Palatinose™
- Sugar-free ISOMALT
- Gut microbiota and COVID-19
- Prebiotic chicory root fibres – nourishing gut microbes for gut health and beyond

The BENEO-Institute

Connecting nutrition and health

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Three pillars of expertise within the BENEO-Institute

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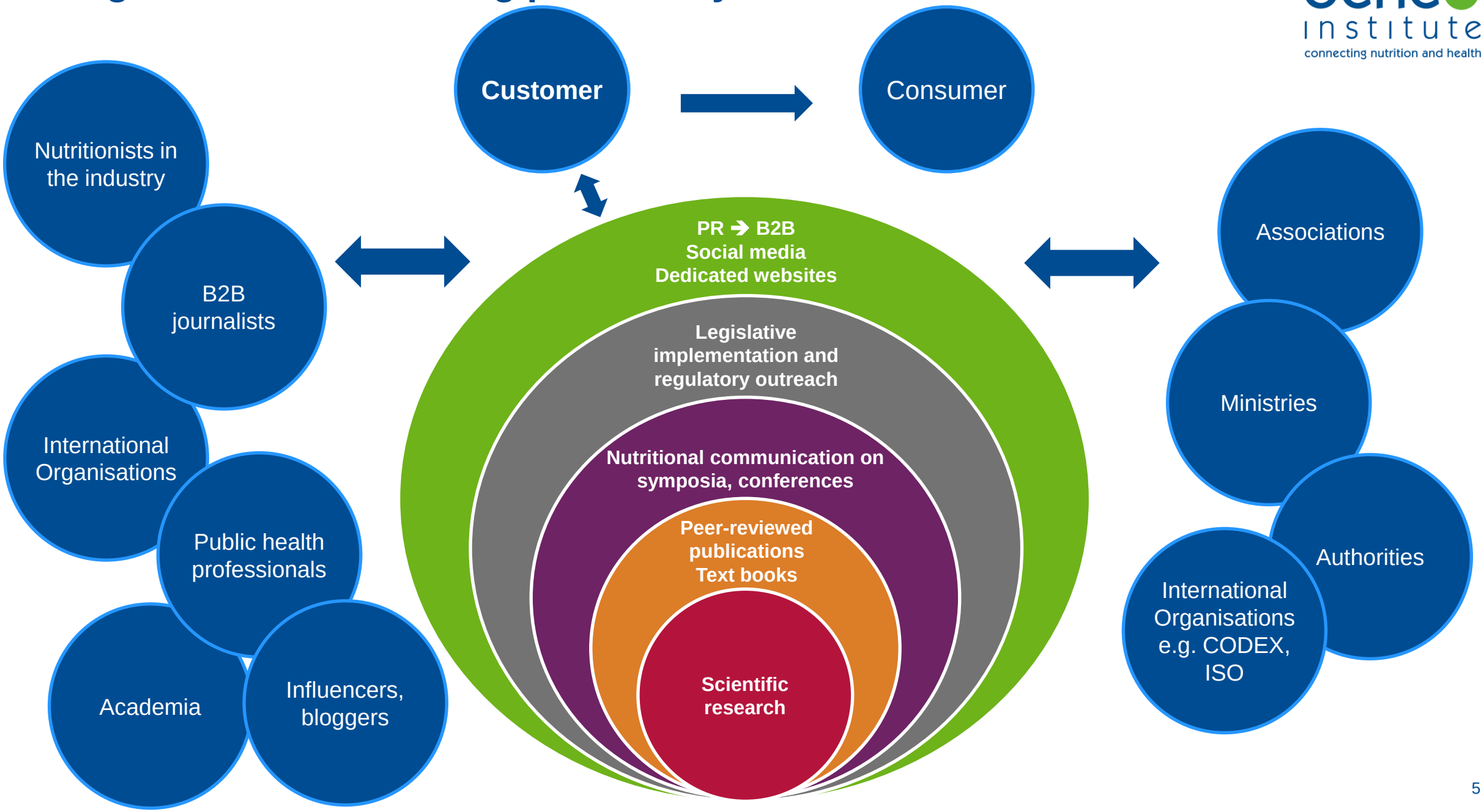
Connecting nutrition and health

Dialogue and trust building process by the BENEO-Institute



Glycaemia and immune health

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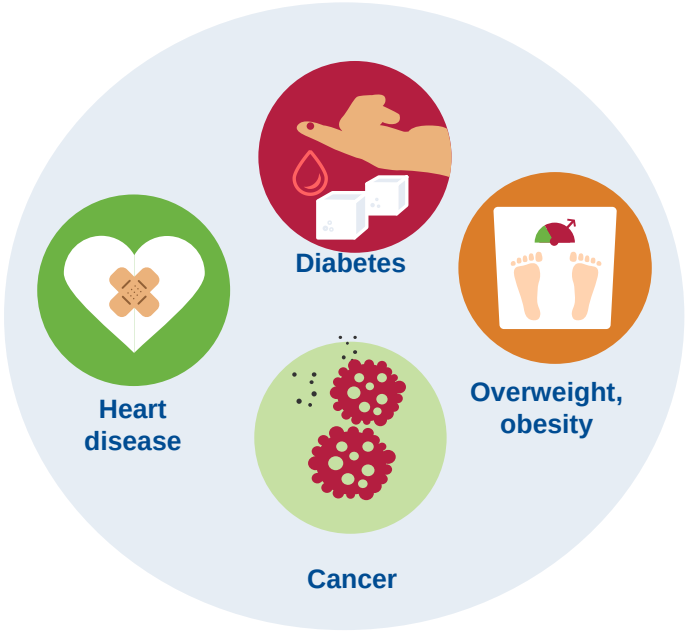
Healthy blood glucose levels matter in both non-communicable diseases and communicable diseases

Non-communicable diseases (non-infectious)



Healthy blood glucose levels matter!

Communicable diseases (infectious)

- High blood glucose, even for short-term, weakens and impairs immunity[1]
- COVID-19 infections and deaths are higher in countries with a high prevalence of diabetes[2]

1 Jafar et al (2016) Am J Med Sci 351(2):201-11. https://pubmed.ncbi.nlm.nih.gov/26897277/
2 International Diabetes Federation. IDF Diabetes Atlas 10th ed (2021) https://www.diabetesatlas.org

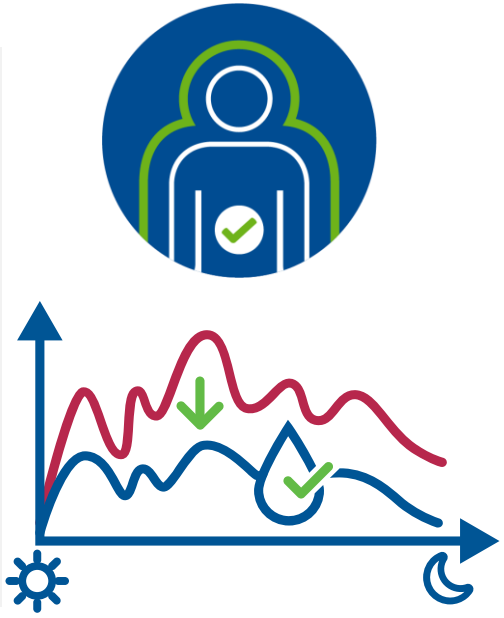
Icons from www.flaticon.com

Blood glucose management and the immune system – New learning

In 2016 a review article in the American Journal of Medical Sciences was published by researchers of the Texas Tech University Health Science Centre related to the effect of short-term hyperglycaemia on the innate immune system. *They concluded*:

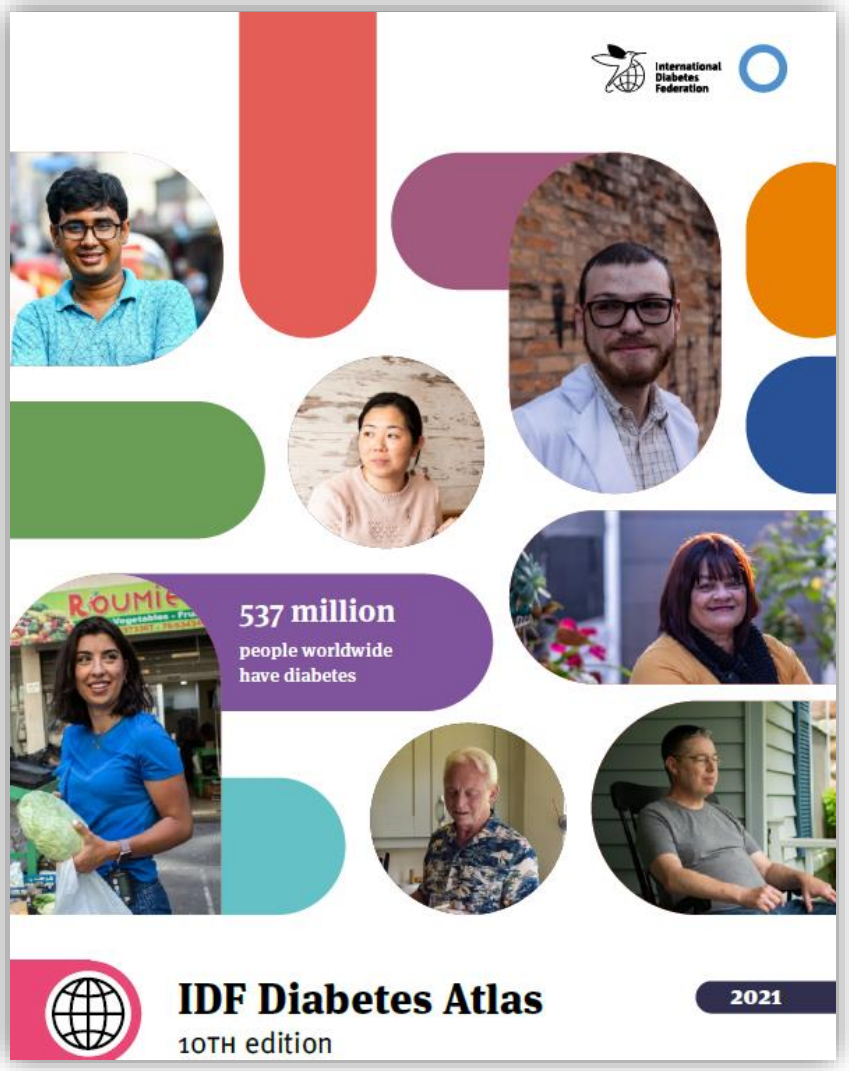
“In summary, acute hyperglycaemia can significantly alter innate immune response to infection, and this potentially explains some of the poor outcomes in hospitalised patients who develop hyperglycaemia“

Jafar N, Edriss H, Nugent K (2016) The Effect of Short-Term Hyperglycemia on the Innate Immune System. Am J Med Sci 351(2): 201–211



Key findings from the latest International Diabetes Atlas

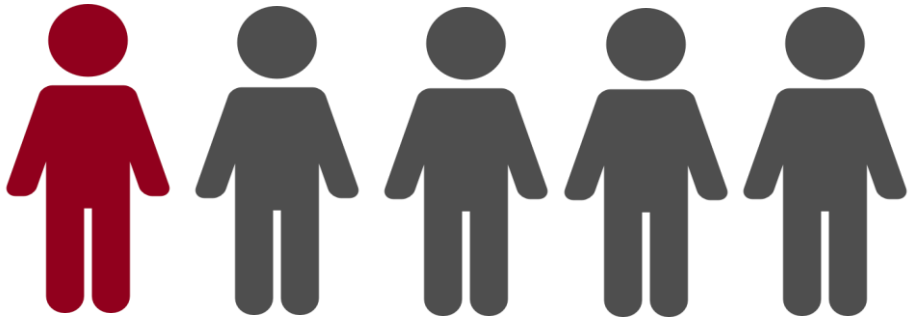
Diabetes and COVID-19



- During the first wave, people with diabetes had a 3.6-fold higher likelihood of being hospitalised due to COVID-19, compared to those without diabetes
- People with diabetes who are hospitalised with COVID-19 are 2.3 times more at risk of death than people without diabetes who were admitted to the same hospital or health system
- Countries that had a high prevalence of diabetes reported increased numbers and rates of COVID-19 infections and deaths than countries with a lower prevalence of diabetes

International Diabetes Federation. IDF Diabetes Atlas 10th Edition (2021) https://www.diabetesatlas.org

High blood glucose is very prevalent in Malaysia



1 in 5 adults has diabetes (3.9 million)

Half are unaware they have diabetes

Type 2 diabetes

90% of all diabetes

Prediabetes

22.1%

Gestational diabetes (GDM)

13.5%

GDM is associated with severe COVID-19 progression in pregnant women

Diabetes prevalence: Institute for Public Health, National Institutes of Health, Ministry of Healthy Malaysia. Key Findings of the National Health and Morbidity Survey (NHMS) 2019. http://iku.gov.my/images/IKU/Document/REPORT/NHMS2019/Infographic_Booklet_NHMS_2019-English.pdf
Gestational diabetes prevalence: Institute for Public Health, National Institutes of Health, Ministry of Healthy Malaysia. NHMS 2016: Maternal and Child Health. http://iku.moh.gov.my/images/IKU/Document/REPORT/2016/NHMS2016ReportVolumeII-MaternalChildHealthFindingsv2.pdf
Prediabetes prevalence: Mustafa et al 2011. Diabetes Care. 34(6):1362-64. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3114358/

Capobianco et al. (2020) Eur J Obstet Gynecol Reprod Biol. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7363619/
Panagiotakopoulos et al. (2020) MMWR Morb Mortal Wkly Rep 69(38):1355–1359. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7727498/pdf/mm6938e2.pdf
Allotey et al. (2020) BMJ 370:m3320. https://www.bmj.com/content/bmj/370/bmj.m3320.full.pdf

Smart ingredients for lower blood glucose

Palatinose™, ISOMALT

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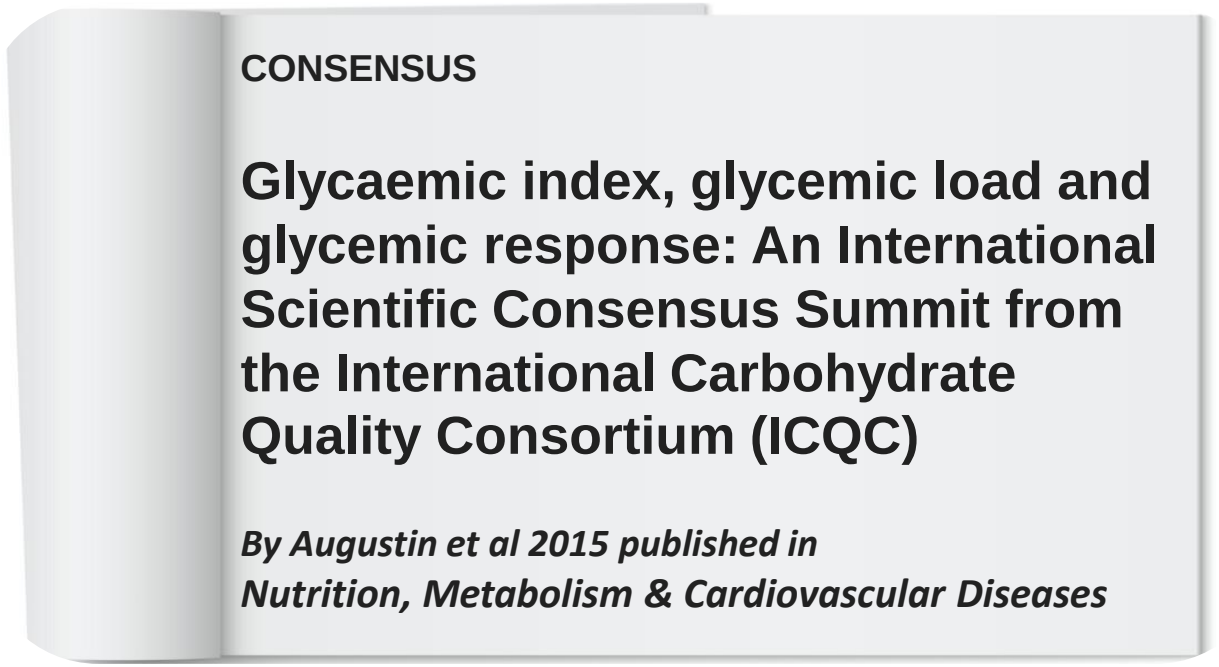
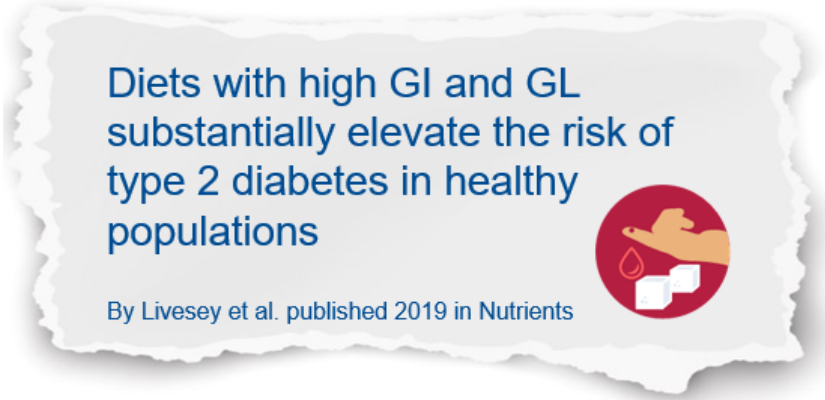
Lower blood glucose levels are beneficial

Consensus by scientific experts



- **Outcome of scientific consensus summit:**
  - Low GI/GL diets are beneficial as they:
    - Improve blood glucose levels in diabetic people
    - Reduce the risk of type 2 diabetes and coronary heart disease
  - Probable evidence that low GI/GL diets reduce total body fat mass and support weight management



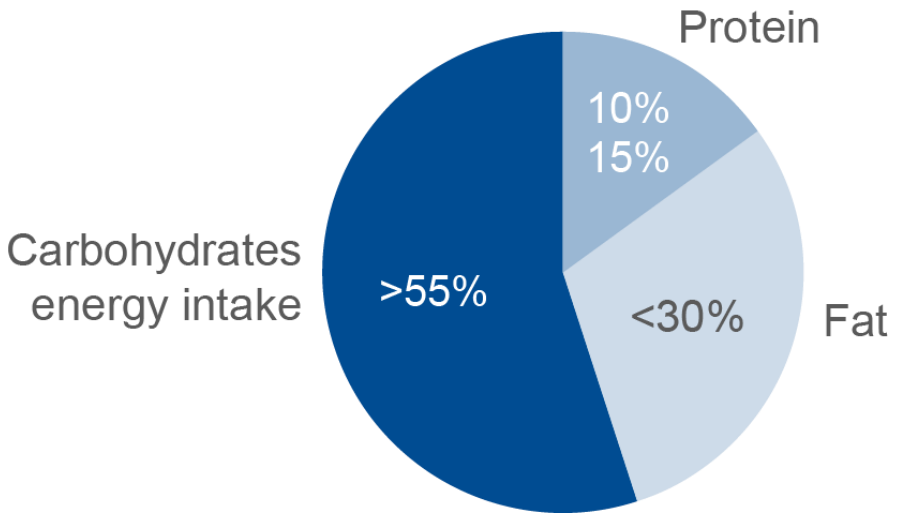
- Livesey and co-workers support the use of GI and GL as markers of carbohydrate food quality in dietary guidelines for general populations

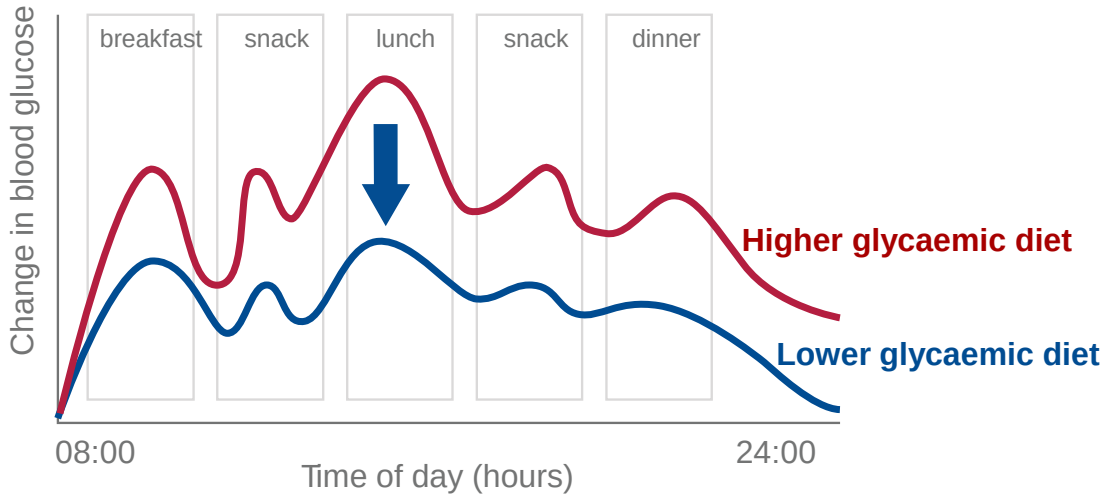
Augustin et al (2015) Nutr Metab Cardiovasc Dis. 25(9):795-815. https://www.ncbi.nlm.nih.gov/pubmed/26160327.
This publication was based on the meeting "Glycaemic Index, Glycaemic Load and Glycaemic Response: an International Scientific Consensus Summit" held in Stresa, Italy, on 6-7th June 2013

Livesey et al. (2019) Nutrients 11(6). https://www.mdpi.com/2072-6643/11/6/1280
Livesey and Livesey (2019) Mayo Clinic Proceedings: Innovations, Quality & Outcomes 3(1):52–69. https://mcpiqojournal.org/article/S2542-4548(19)30002-5/fulltext
GI: Glycaemic Index GL: Glycaemic Load

Quality of carbohydrate matters

Lower glycaemic options are preferred





- Carbohydrates are the largest group of nutrients in our diet
- Main source of energy (also preferred energy source)
- Carbohydrates directly affect our blood glucose levels and trigger insulin release, and determine metabolic profile

- Most of the carbohydrate foods are medium to high glycaemic [1]
- This leads to high blood glucose levels
- More low glycaemic options are preferred to replace sugars and fast carbohydrates

1 Henry et al (2021) . Nutr Diabetes. 11(1):2. doi: 10.1038/s41387-020-00145-w. https://pubmed.ncbi.nlm.nih.gov/33414403/

Carbohydrates
Digestibility and blood glucose response

Glucose, Sucrose, Maltodextrin, Starch

Highly digestible, Full and fast uptake

Palatinose™ (isomaltulose)

Slowly digestible, Full and slow uptake

Polyols, Fibres

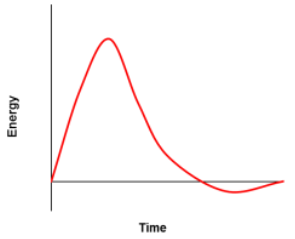
Low / non-digestible carbohydrates

Stomach

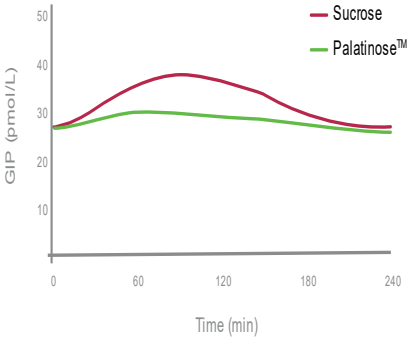
Small intestine

Large intestine

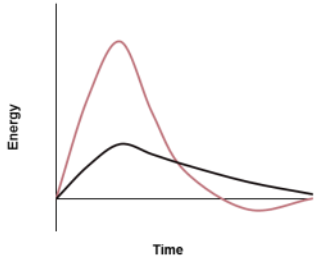
Fast, complete uptake
High glycaemic



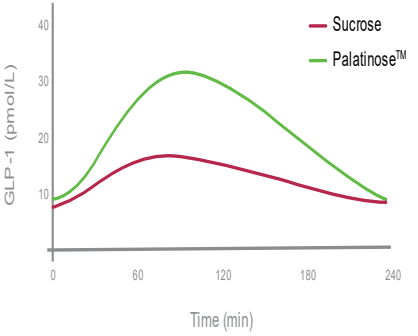
↑ GIP gut hormone



Slow, sustained uptake
Low glycaemic



↑ GLP-1 gut hormone



Non-glycaemic

References in healthy population groups:
Maeda et al 2013 J Diabetes Investig 4 (3) 281-6.
Pfeiffer and Keyhani-Nejad (2018) Trends Endocrinol Metab. 29(5):289-299.

References in diabetic population groups:
Ang and Linn (2014) Am J Clin Nutr 100:1059–68 (data shown).
Keyhani-Nejad et al. (2016) Diabetes Care 39(3):e38-e39.

Plant-based smart ingredients for lower blood glucose

Palatinose™ and ISOMALT

Sugar beet plants

Palatinose™ (isomaltulose) and ISOMALT are made from sucrose that comes from sugar beets

Introducing Palatinose™ (isomaltulose)

What is Palatinose™ (isomaltulose)?

Sugar beet

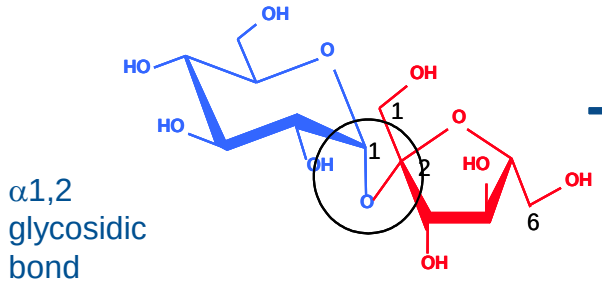
Sucrose

Sucrose

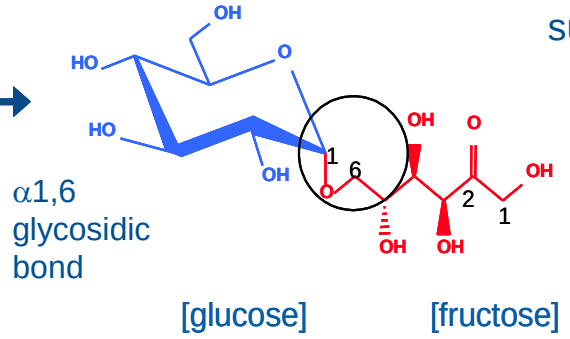
Palatinose™ (isomaltulose)

Palatinose™

- Palatinose™ is a slow-release, fully digestible low GI carbohydrate
- Disaccharide of glucose and fructose linked by a strong and stable α1,6 glycosidic bond
- Provides a slower and more balanced supply of energy than fast carbohydrates
- Found naturally in small amounts in honey and sugar cane juice
- Half the sweetness as sucrose; sweetness profile similar to sucrose; provides bulk

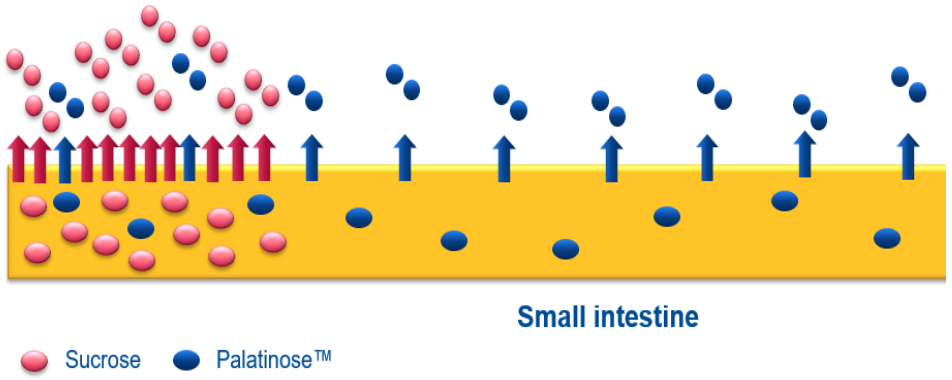


Enzyme

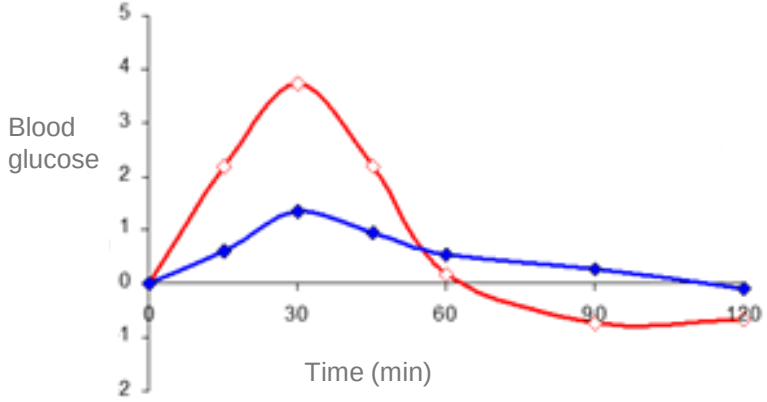


Nutritional benefits of Palatinose™

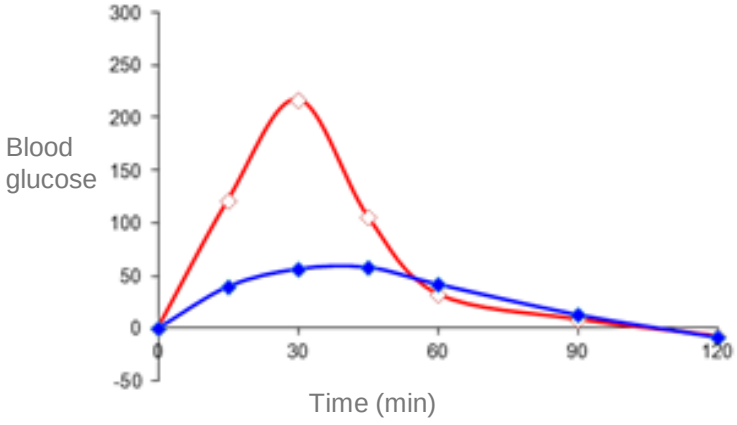
Sustained energy



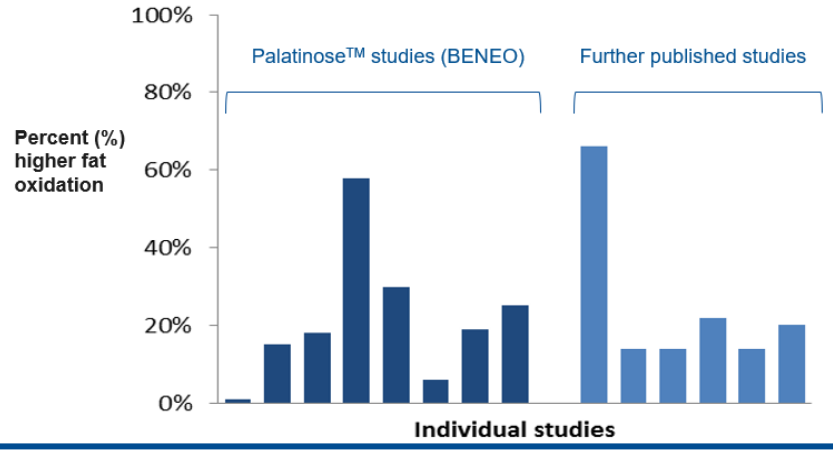
Lower, balanced blood glucose



Lower insulin release



Promotes fat burning



Palatinose™

The carbohydrate for sustained and balanced energy supply

Sucrose

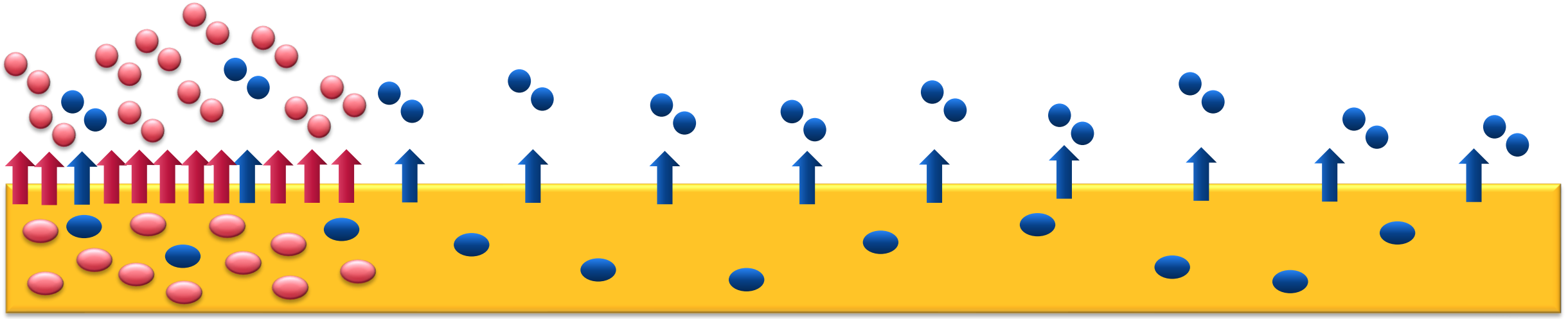
- Early and fast energy release
- Completely used as energy source

→ **"Fast energy"**

Palatinose™

- Slow energy release along entire small intestine
- Completely used as energy source

→ **"Sustained and balanced energy"**



Small intestine

Small intestine of 4-5 metres in length

Sucrose Palatinose™

Palatinose™

- Low glycaemic, slow-release carbohydrate
- Blood glucose response is lower and balanced
- Well-tolerance

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Blood glucose management matters for all age groups

Lower blood glucose profile with fewer fluctuations are healthier

Pre-conception & pregnancy

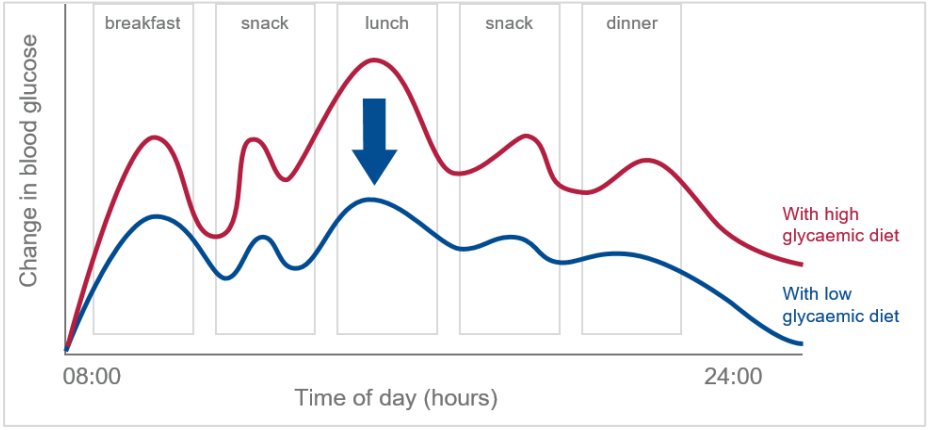
infants and small children

school children & adolescence

young adults & middle age

elderly

very old



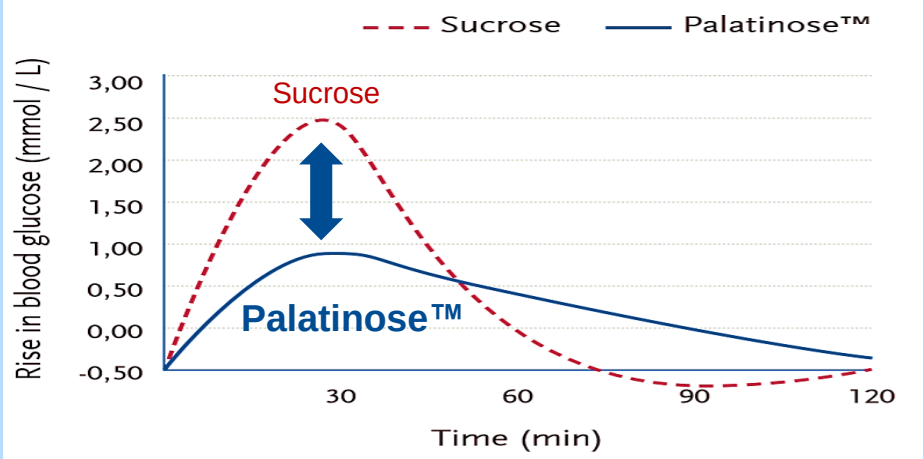
From theory to practice

Balanced and lower blood glucose levels with Palatinose™

In theory

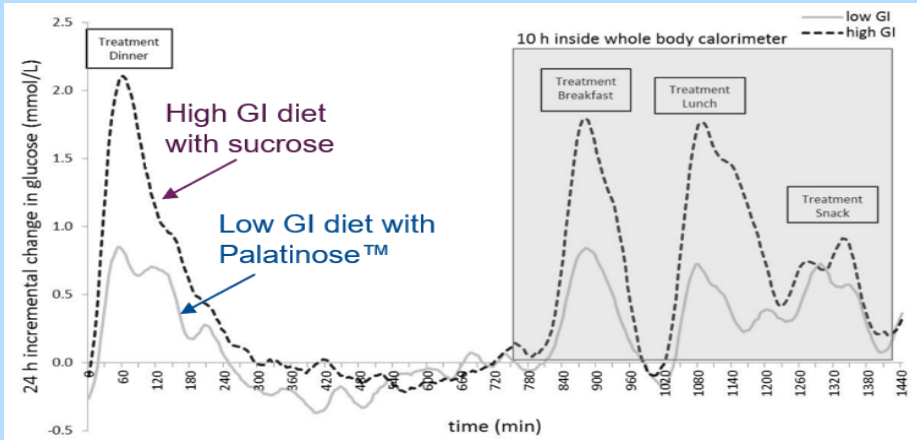
The proof with Palatinose™

In a single intake



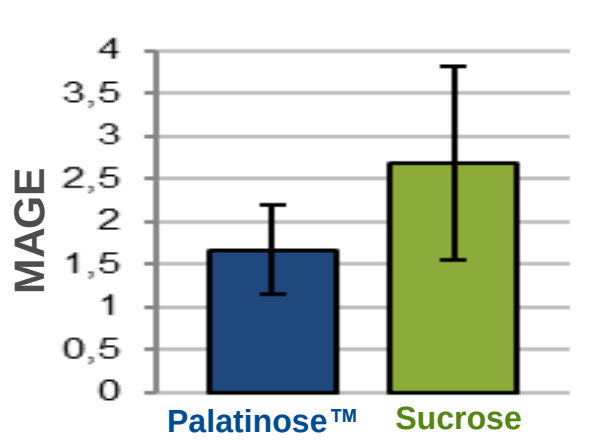
The proof with Palatinose™

Over 24 hours



Tested in 20 healthy men using 24h continuous glucose monitoring in randomised, double-blind cross-over design.

Balanced blood glucose (MAGE)

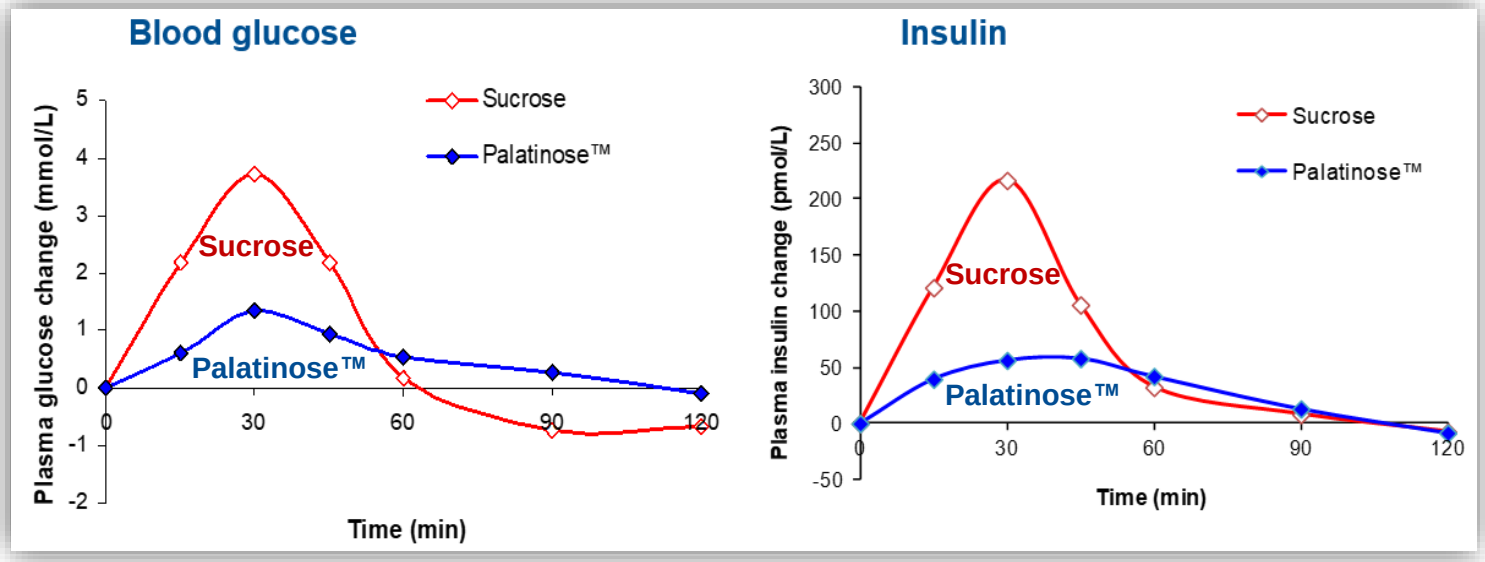


MAGE: Mean amplitude of glycaemic excursion

Tan et al 2017. Nutrients 9(4): 347.http://www.mdpi.com/2072-6643/9/4/347
Sydney University's Glycaemic Index Research Service (SUGiRS) (2002)
Jeyakumar et al 2017. Nutrients 9:473. http://www.mdpi.com/2072-6643/9/5/473

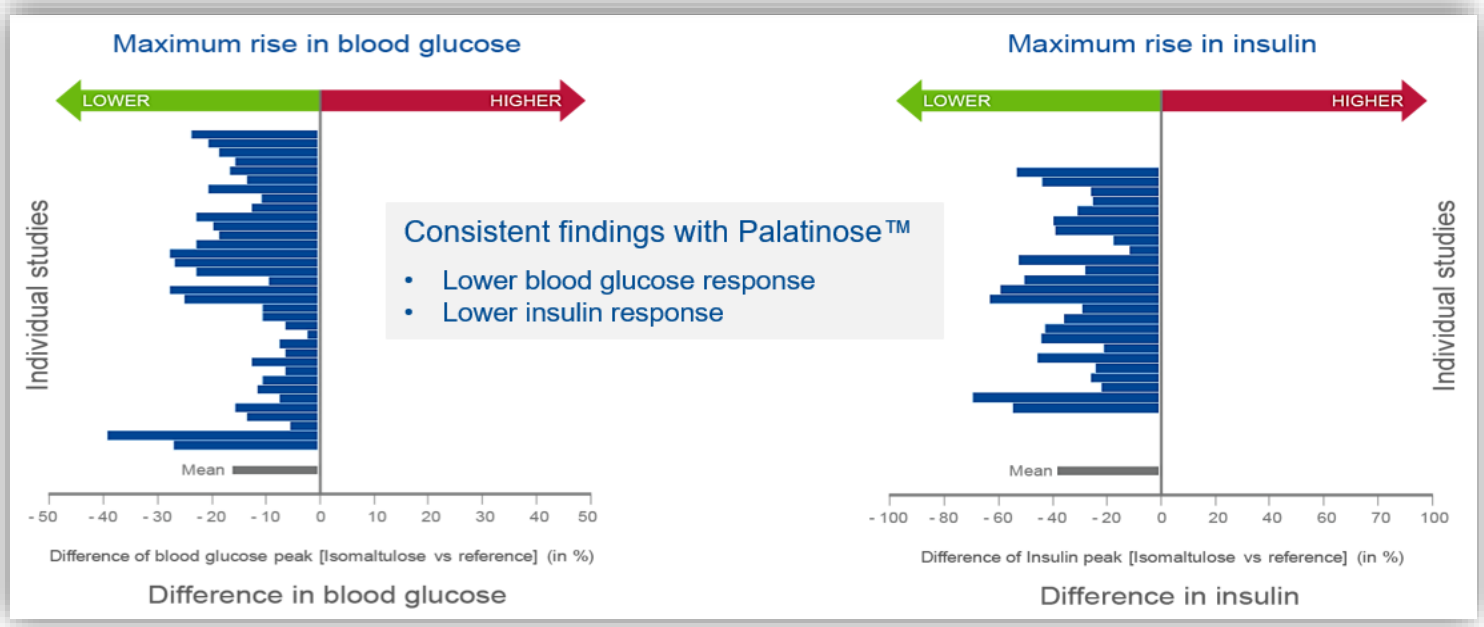
Blood glucose response is always slow and low with Palatinose™

Confirmed in over 30 human trials



Blood glucose levels of healthy adults who consumed Palatinose™ or sucrose.

Sydney University's Glycaemic Index Research Service (SUGiRS) (2002)

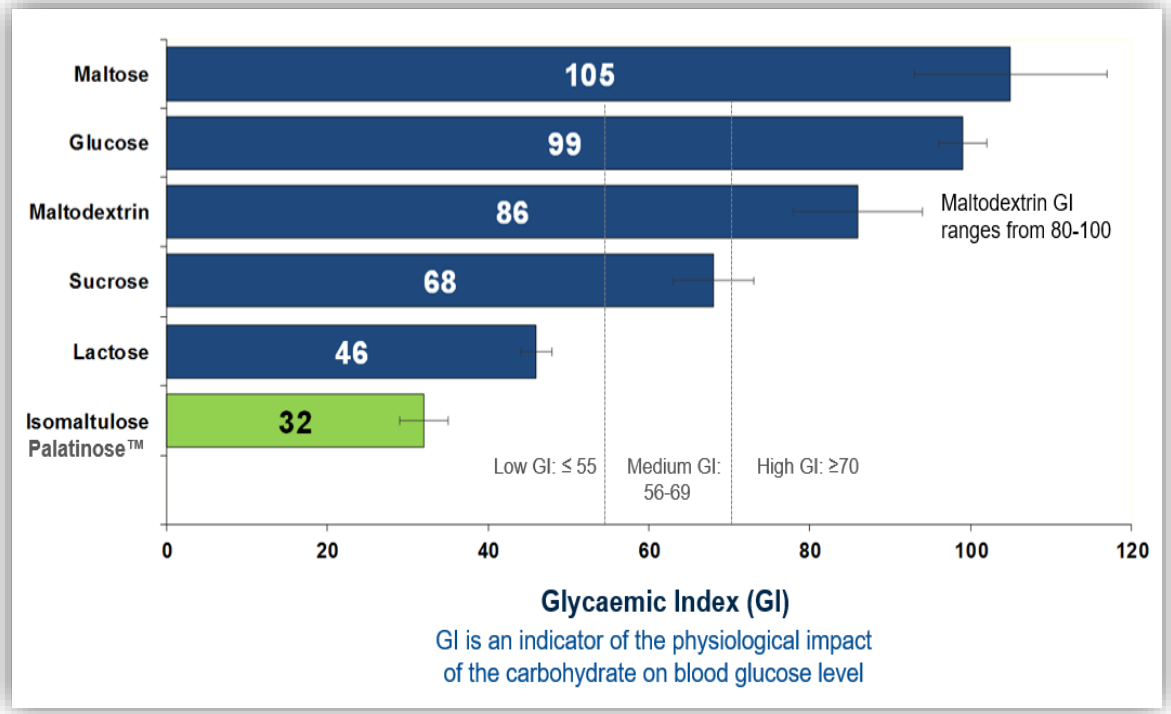


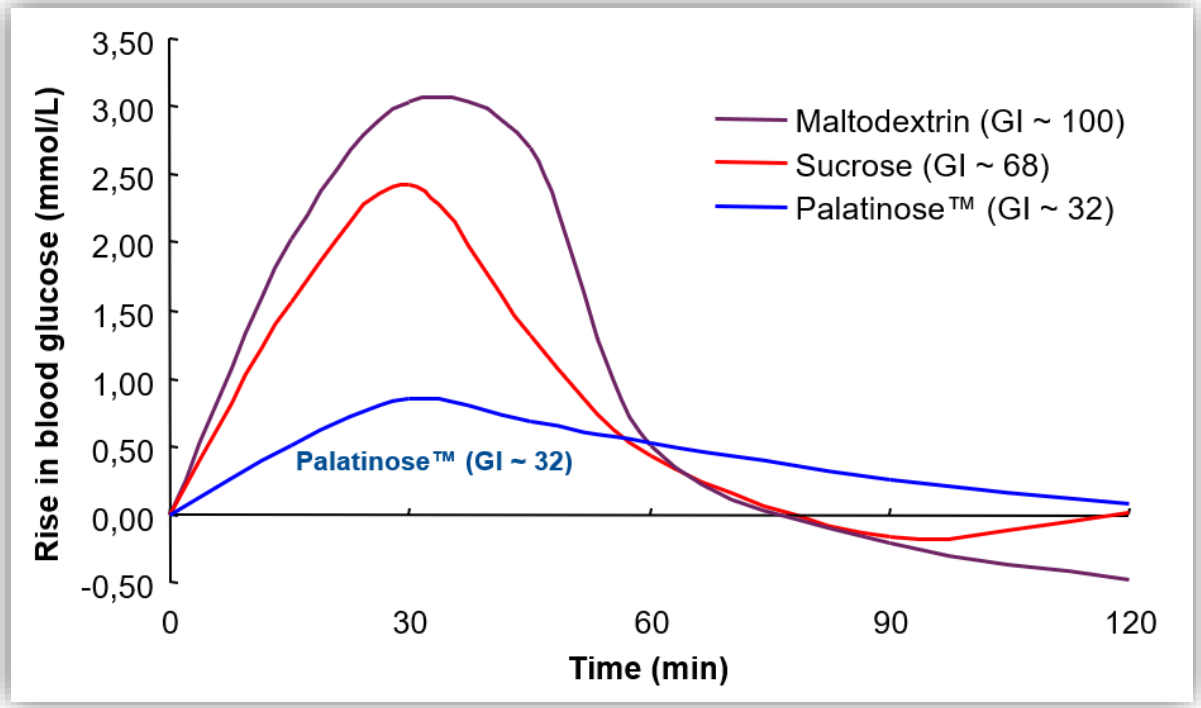
Lower blood glucose and insulin responses confirmed in over 30 human trials

Subjects included healthy adults, overweight and obese adults, those with normal or impaired glucose tolerance (including type 1 and type 2 diabetes mellitus), and healthy children.

Glycaemic Index (GI) – A tool for ranking carbohydrates

Not all carbohydrates are created the same





Data from Foster-Powell et al (2002), Atkinson et al (2008), Livesey 2004 (personal communication), Sydney University's Glycaemic Index Research Service (SUGiRS) (2002), Atkinson et al (2021), www.glycemicindex.com

Lowering blood glucose matters, especially in Asians!

Palatinose™ is part of the solution

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Why are Asians at higher risk of having high blood glucose?

TOFI = Thin Outside Fat Inside

Visceral Adiposity and Glucoregulatory Peptides are Associated with Susceptibility to Type 2 Diabetes: The TOFI_Asia Study

By Sequeira et al 2020

Published in Obesity (Silver Spring)

Management of Prediabetes in Malaysian population: An experts' opinion

By Mafauzy et al 2020

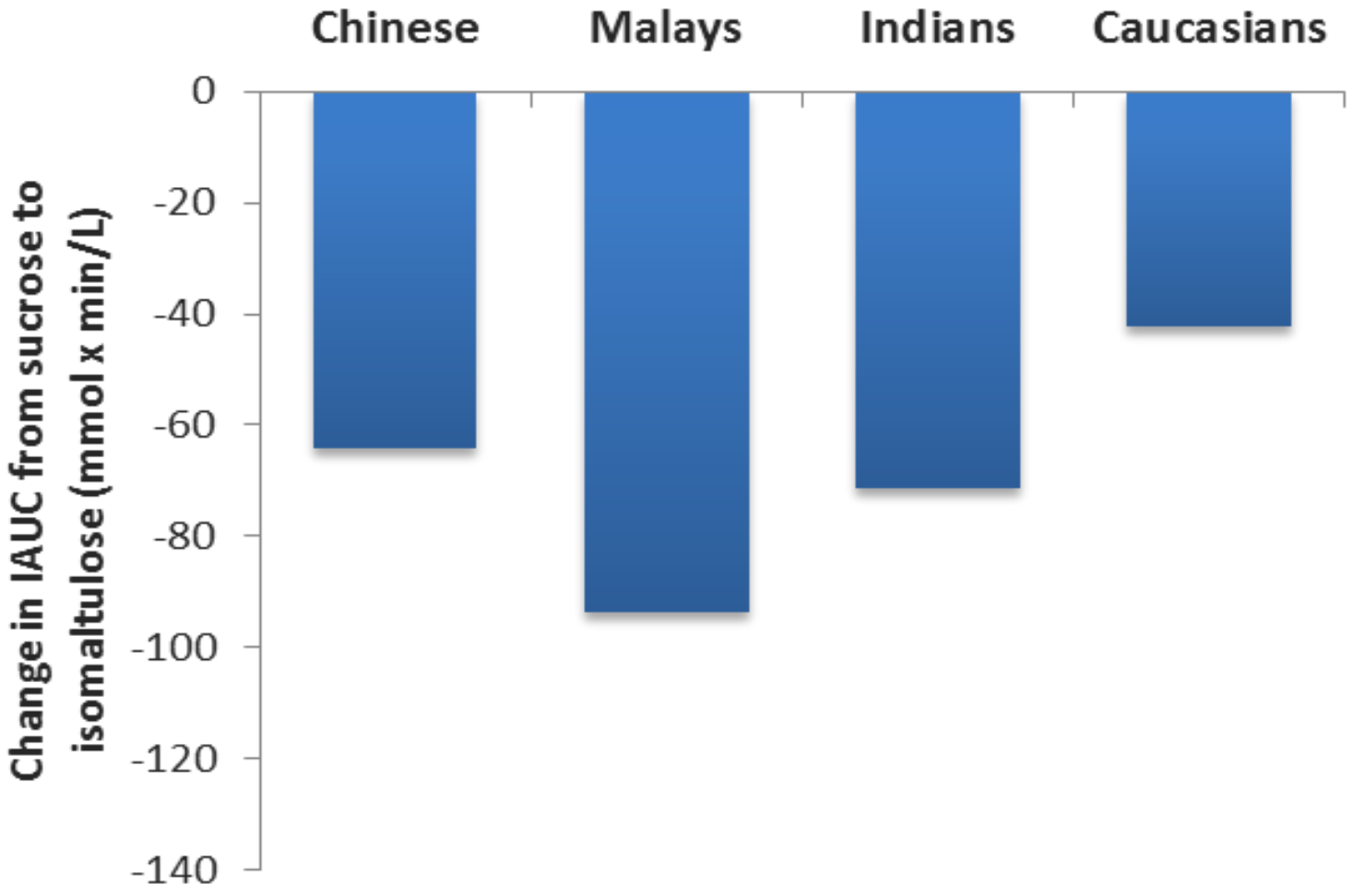
Published in the Medical Journal of Malaysia

- Asians have a higher risk of diabetes as compared to Caucasians
  - Have higher abdominal fat
  - Develop diabetes at lower BMI
  - High carbohydrate intake (refined carbohydrates), low physical activity
- Lifestyle modification is first-line treatment for prediabetes and diabetes

Sequeira et al (2020) Obesity 28(12):2368-78. https://pubmed.ncbi.nlm.nih.gov/33040488/
Mafauzy et al (2020) Med J Malaysia 75(4):419-27. https://pubmed.ncbi.nlm.nih.gov/32724007/
Tan et al (2017) Nutrients 9(4):347. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5409686/
Tey et al (2014) Ann Acad Med Singap 43(11):524-5. https://pubmed.ncbi.nlm.nih.gov/25523855/

Reducing blood glucose levels matters

Asians benefit even more from Palatinose™



- Replacing sucrose with Palatinose™:
  - Significantly reduced blood glucose levels in all groups
  - Asians responded more than Caucasians

Tan et al 2017. Nutrients 9(4): 347. Open access. Available from http://www.mdpi.com/2072-6643/9/4/347

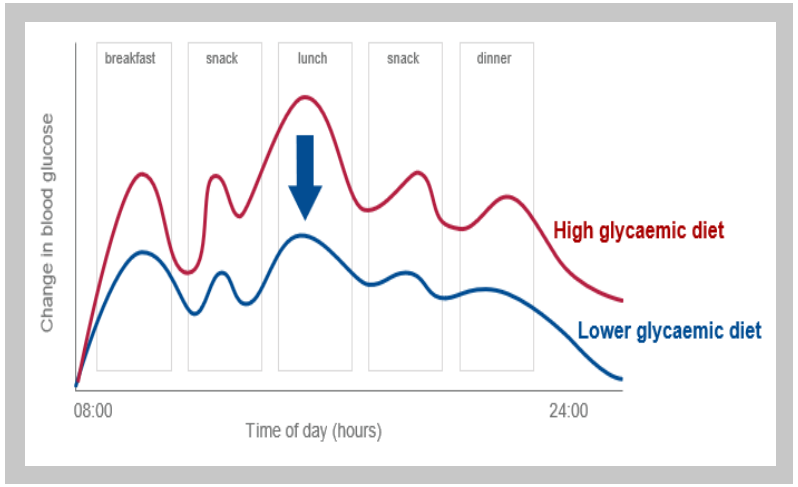
Study design: Randomised, crossed-over clinical study comparing 50g Palatinose™ versus 50g sucrose in 40 healthy adults from 4 ethnic groups.

IAUC: Incremental area under the curve for blood glucose response

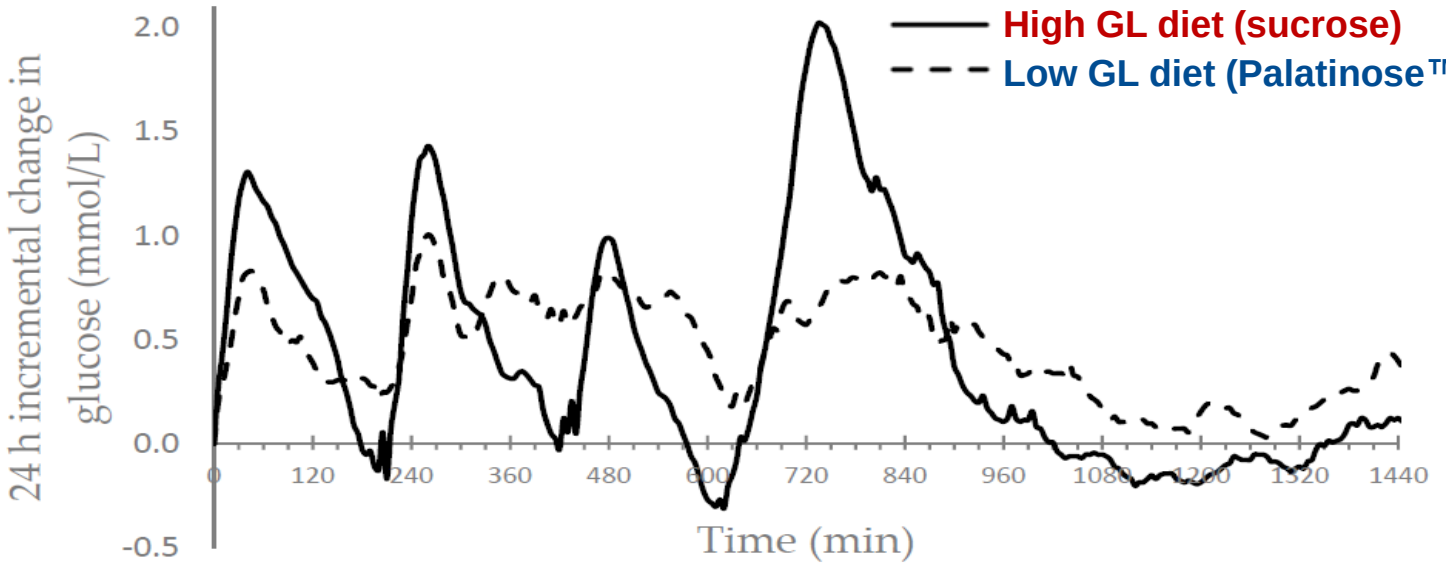
Proof of concept: The low glycaemic concept works

Palatinose™ as part of a low GI diet reduce the blood glucose response

In theory



The proof with Palatinose™



- Lower maximum glucose levels over 24h (p=0.0024) with low GL diet, especially after low GL dinner (p=0.0084)
- Balanced blood levels over 24h (p<0.0001); fewer swings in blood glucose as measured by MAGE

Helps you to achieve lower and more balanced blood glucose levels over the day and improve the nutritional quality of the diet

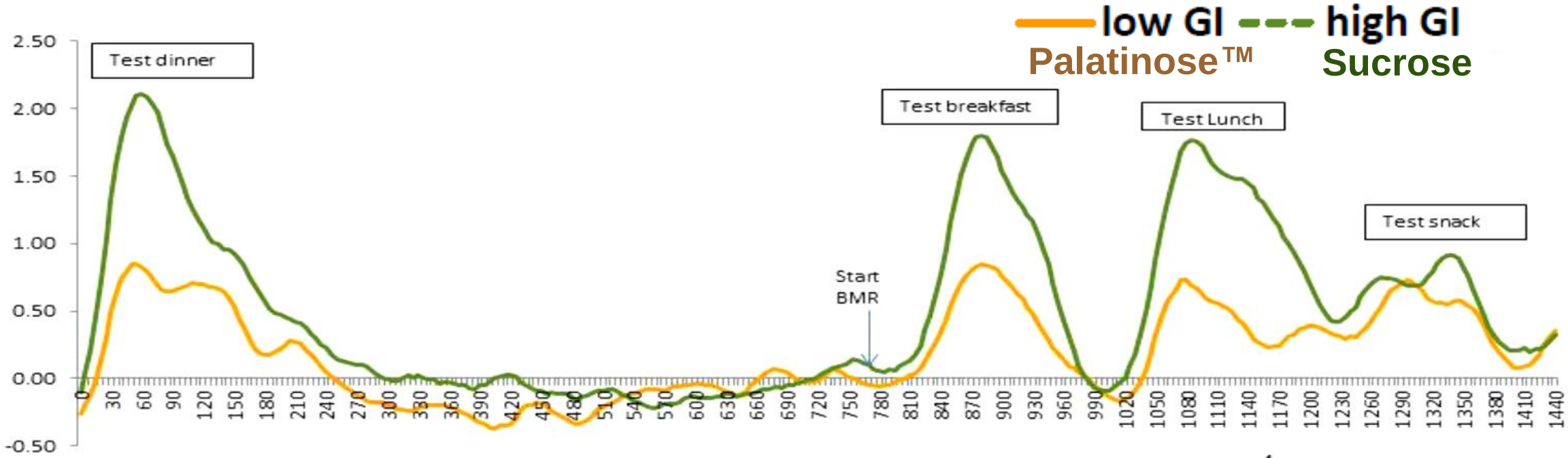
Camps et al. (2021) Nutrients 13:3102. https://www.mdpi.com/2072-6643/13/9/3102/htm

Study design: Randomised, single-blind, controlled, cross-over study in 15 healthy Chinese men who consumed a low glycaemic load (GL) diet incorporated with innovative ingredients, 4.2% cereal beta-glucans in noodles consumed at breakfast, and Palatinose™ added to tea and jelly that were consumed during lunch (25g Palatinose™), afternoon snack (55g Palatinose™), and dinner (22g Palatinose™) versus a high GL diet with equal amount of available carbohydrates and sucrose over 24 hours.

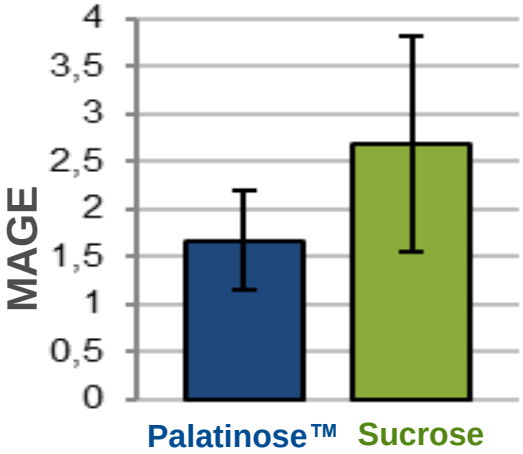
GL: Glycaemic Load
MAGE: Mean amplitude of glycaemic excursion

Low GI diet incorporating Palatinose™

Lower and more balanced blood glucose response over 24 hours



- Lower blood glucose response over 24h (p=0.002)
- Balanced blood levels over 24h (p<0.001); fewer swings in blood glucose as measured by MAGE
- Higher fat oxidation (fat burning) after low GI breakfast (p=0.026), lunch (p<0.001), and snack (p=0.013)



Jeyakumar et al 2017. Nutrients 9:473. Available from http://www.mdpi.com/2072-6643/9/5/473

Study design: Randomised, double-blind, cross-over study comparing a low GI diet (Palatinose™) versus a high GI diet (sucrose) in 20 healthy adults aged 21-29 years old, BMI: 18-29 kg/m^2.

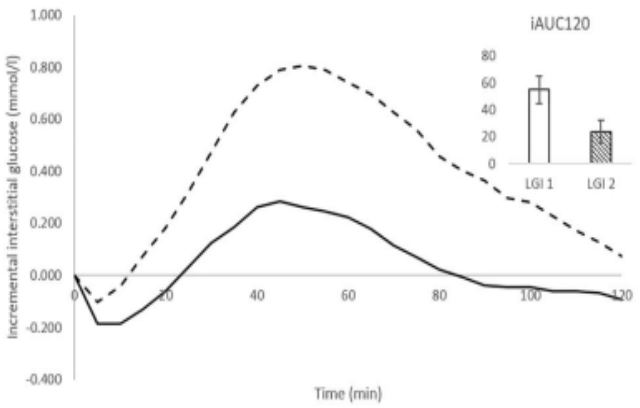
Inclusion Palatinose™ or sucrose during the test meals: 30g with dinner in fruit drink; 30g with breakfast added to tea; 20g with lunch in fruit drink; 20g with snack added to tea.

MAGE: Mean amplitude of glycaemic excursion

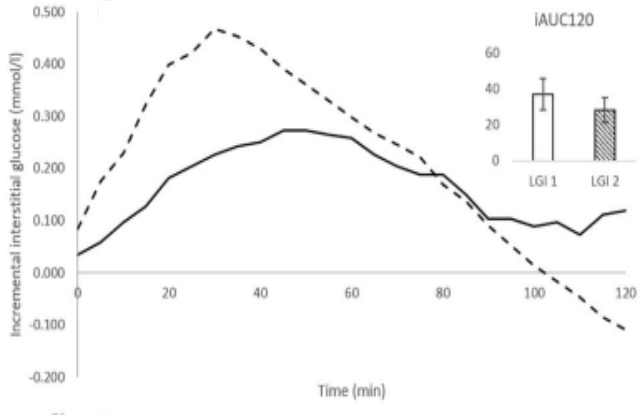
Reducing the GI value of the food is a simple way to improve its nutritional quality

Blood glucose response of Chinese adults after consuming modified low GI biscuit versus basic low GI biscuit eaten at breakfast and snack

Breakfast



Snack



Modified low GI biscuit group

Basic low GI biscuit group

- **Lower blood glucose response was achieved with modified low GI biscuit (GI 24)** versus basic low GI biscuit (GI 54)
- With the inclusion of functional ingredients, such as Palatinose™, it was possible to halve the GI of the biscuit

Low GI biscuit (GI 24) with functional ingredients

Kaur et al. (2020) Nutr Diabetes 10(1):15. https://www.nature.com/articles/s41387-020-0118-5

Study design: Randomised, single blind, placebo-controlled cross-over study in 13 healthy Chinese adults who consumed either basic biscuit (GI of 54) or modified biscuit with low GI sweetener (GI of 24) at breakfast and afternoon snack. Lunch and dinner were standardised.

Introducing ISOMALT

Sugar-free ingredient

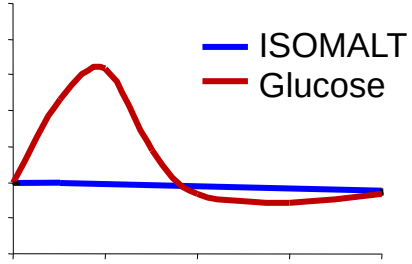
beneo institute
connecting nutrition and health

Benefits of ISOMALT

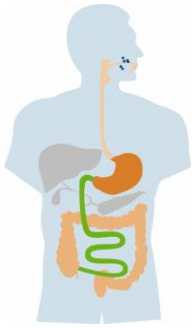
ISOMALT

Tooth friendly

Very low blood glucose response



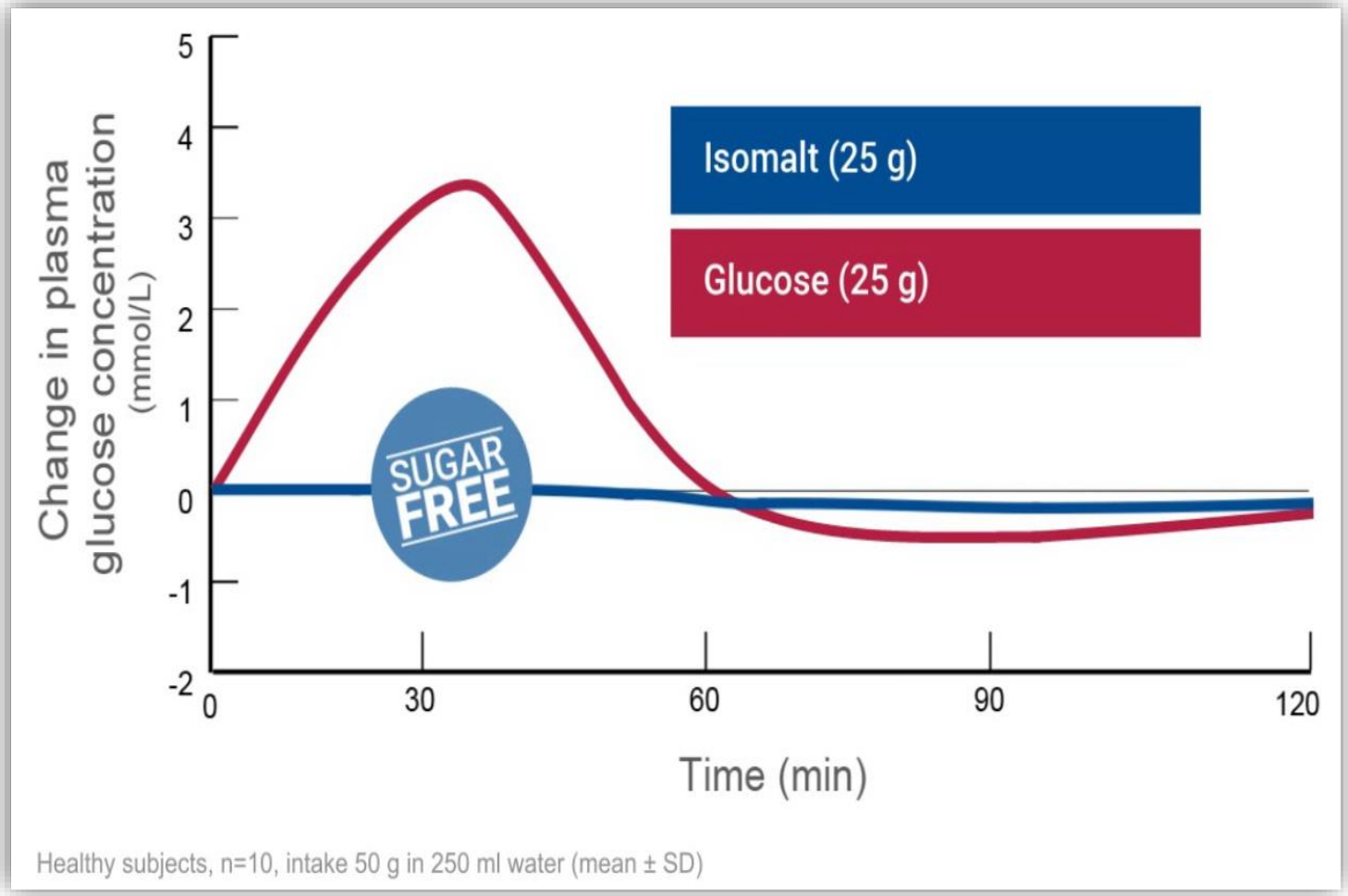
Low/non digestible



Low caloric value

ISOMALT = 2 kcal/g

ISOMALT
Very low blood glucose response



- The blood glucose response of ISOMALT has been investigated in:
  - At least 10 human intervention studies with healthy volunteers, type 1 and type 2 diabetics in comparison with glucose, sucrose or fructose
  - All studies confirm that isomalt has a very low blood glucose and insulin response

Blood glucose response curve of Isomalt by Sydney University's Glycaemic Index Research Service (SUGiRS), 2002.
This has been shown in a number of studies with healthy populations (Thiébaud et al. 1984; Bachmann et al. 1984; Keup and Pütter 1974; Sydney University's Glycaemic Index Research Service 2002; Slama 1989) as well as in diabetic populations including type 1 diabetes mellitus (Kaspar 1984) and type 2 diabetes mellitus (Bachmann et al. 1984; Drost et al. 1980; Petzoldt et al. 1982; Slama 1989).

Gut microbiota and COVID-19

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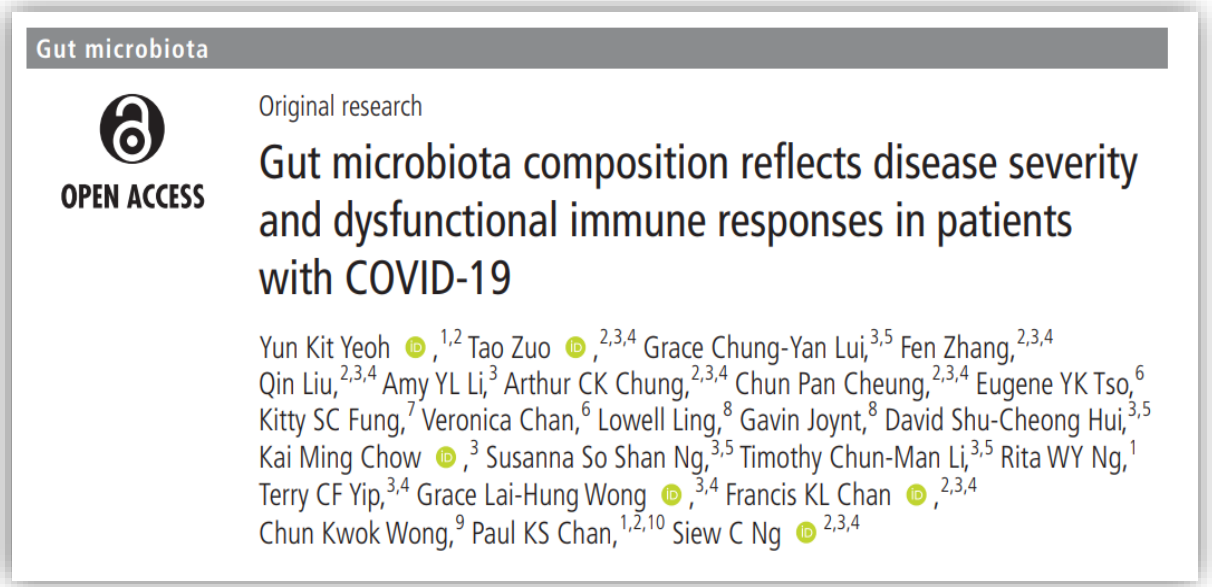
Gut microbiota and COVID-19

What is already known?



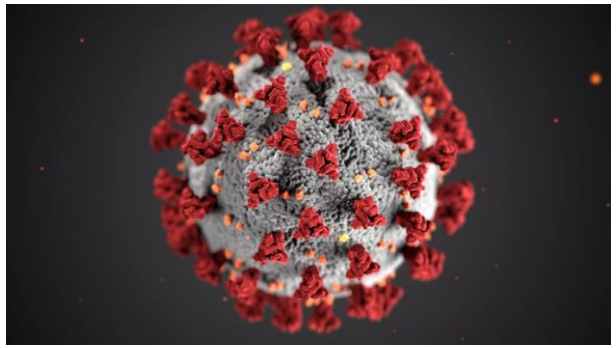
Gut microbiota

OPEN ACCESS

Original research

Gut microbiota composition reflects disease severity and dysfunctional immune responses in patients with COVID-19

Yun Kit Yeoh ,[1,2] Tao Zuo ,[2,3,4] Grace Chung-Yan Lui,[3,5] Fen Zhang,[2,3,4] Qin Liu,[2,3,4] Amy YL Li,[3] Arthur CK Chung,[2,3,4] Chun Pan Cheung,[2,3,4] Eugene YK Tso,[6] Kitty SC Fung,[7] Veronica Chan,[6] Lowell Ling,[8] Gavin Joynt,[8] David Shu-Cheong Hui,[3,5] Kai Ming Chow ,[3] Susanna So Shan Ng,[3,5] Timothy Chun-Man Li,[3,5] Rita WY Ng,[1] Terry CF Yip,[3,4] Grace Lai-Hung Wong ,[3,4] Francis KL Chan ,[2,3,4] Chun Kwok Wong,[9] Paul KS Chan,[1,2,10] Siew C Ng [2,3,4]

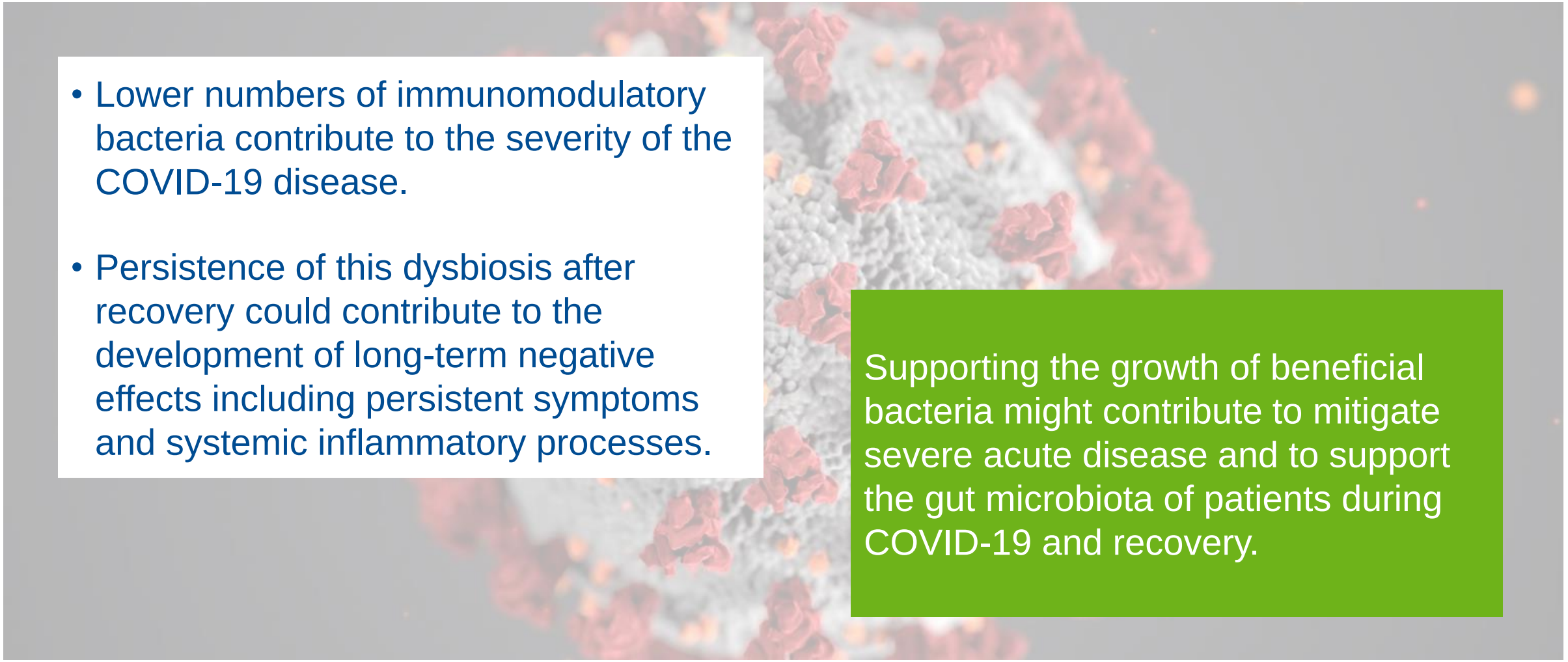


- SARS-CoV-2 primarily infects the respiratory tract
- Abnormal immune responses seem to play a role for severe outcomes and long-term negative effects
- Involvement of the digestive tract is observed:
  - SARS-CoV-2 seems to be reproduced in intestinal cells as the virus can be detected in faecal samples
  - In addition, the gut microbiota composition is affected

Yeoh et al (2021) Gut 70(4):698–706. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7804842/pdf/
Photo by CDC on Unsplash

Gut microbiota and COVID-19

What is the impact on clinical practice in future?



- Lower numbers of immunomodulatory bacteria contribute to the severity of the COVID-19 disease.
- Persistence of this dysbiosis after recovery could contribute to the development of long-term negative effects including persistent symptoms and systemic inflammatory processes.

Supporting the growth of beneficial bacteria might contribute to mitigate severe acute disease and to support the gut microbiota of patients during COVID-19 and recovery.

Yeoh et al (2021) Gut 70(4):698–706. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7804842/pdf/
Photo by CDC on Unsplash

Gut microbiota and COVID-19
Potential for prebiotics

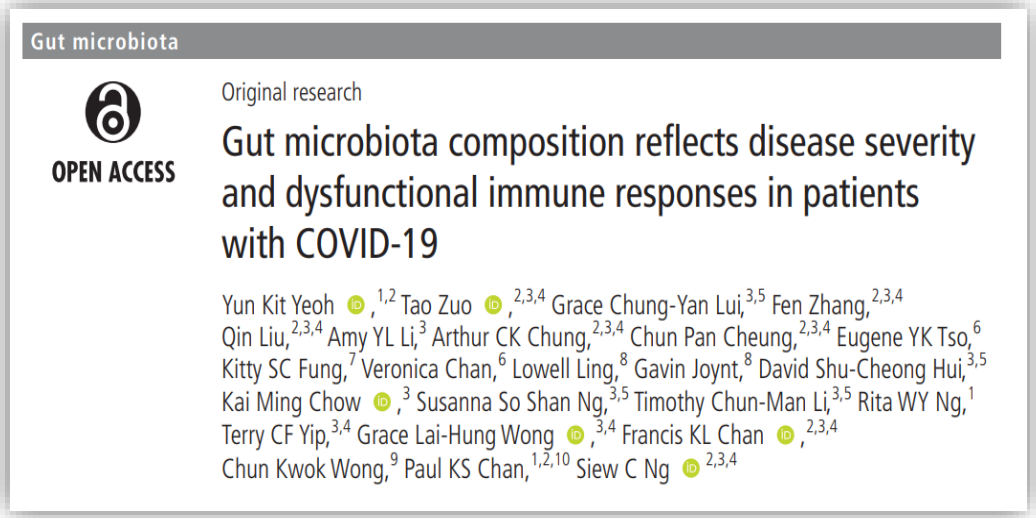
Hypotheses of the link between microbiota and COVID-19 in the early days of the pandemic

International scientific expert in prebiotic research, Professor Glenn Gibson, The University of Reading, UK

"Obviously, there is no evidence that probiotics or prebiotics directly influence COVID-19 and we may never know if they will, but a quick benefit-to-risk thought makes recommendation of some a 'no brainer' for me." [1]

Potential for prebiotics –

Research suggests supporting the growth of beneficial and immunomodulatory bacteria in the gut of patients during and after COVID-19 infection. Yeoh et al 2021. Gut 70(4):698–706.



Gut microbiota

OPEN ACCESS

Original research

Gut microbiota composition reflects disease severity and dysfunctional immune responses in patients with COVID-19

Yun Kit Yeoh [1,2] Tao Zuo [2,3,4] Grace Chung-Yan Lui [3,5] Fen Zhang [2,3,4] Qin Liu [2,3,4] Amy YL Li [3] Arthur CK Chung [2,3,4] Chun Pan Cheung [2,3,4] Eugene YK Tso [6] Kitty SC Fung [7] Veronica Chan [6] Lowell Ling [8] Gavin Joynt [8] David Shu-Cheong Hui [3,5] Kai Ming Chow [3] Susanna So Shan Ng [3,5] Timothy Chun-Man Li [3,5] Rita WY Ng [1] Terry CF Yip [3,4] Grace Lai-Hung Wong [3,4] Francis KL Chan [2,3,4] Chun Kwok Wong [9] Paul KS Chan [1,2,10] Siew C Ng [2,3,4]

[1] ISAPP Science Blog by Prof Glenn Gibson, The University of Reading, UK, published on 18th Mar 2020 from https://isappscience.org/can-probiotics-and-prebiotics-go-viral/
Yeoh et al (2021) Gut 70(4):698–706. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7804842/pdf/

Prebiotic chicory root fibres

Nourishing gut microbes for gut health and beyond

beneo institute
connecting nutrition and health

Importance of the gut and a balanced microbiota for immunity support are already addressed in scientific and public health activities

ISAPP
International Scientific Association for PROBIOTICS and PREBIOTICS

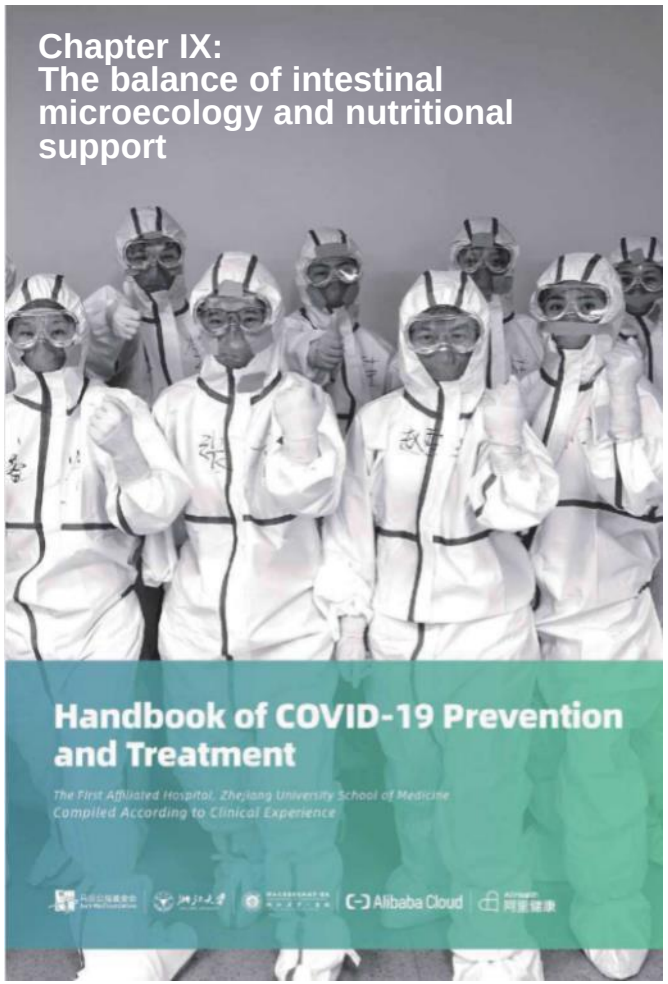
International scientific expert in prebiotic research, Professor Glenn Gibson, The University of Reading, UK

"Obviously, there is no evidence that probiotics or prebiotics directly influence COVID-19 and we may never know if they will, but a quick benefit-to-risk thought makes recommendation of some a 'no brainer' for me"

United Kingdom

Malaysia

China

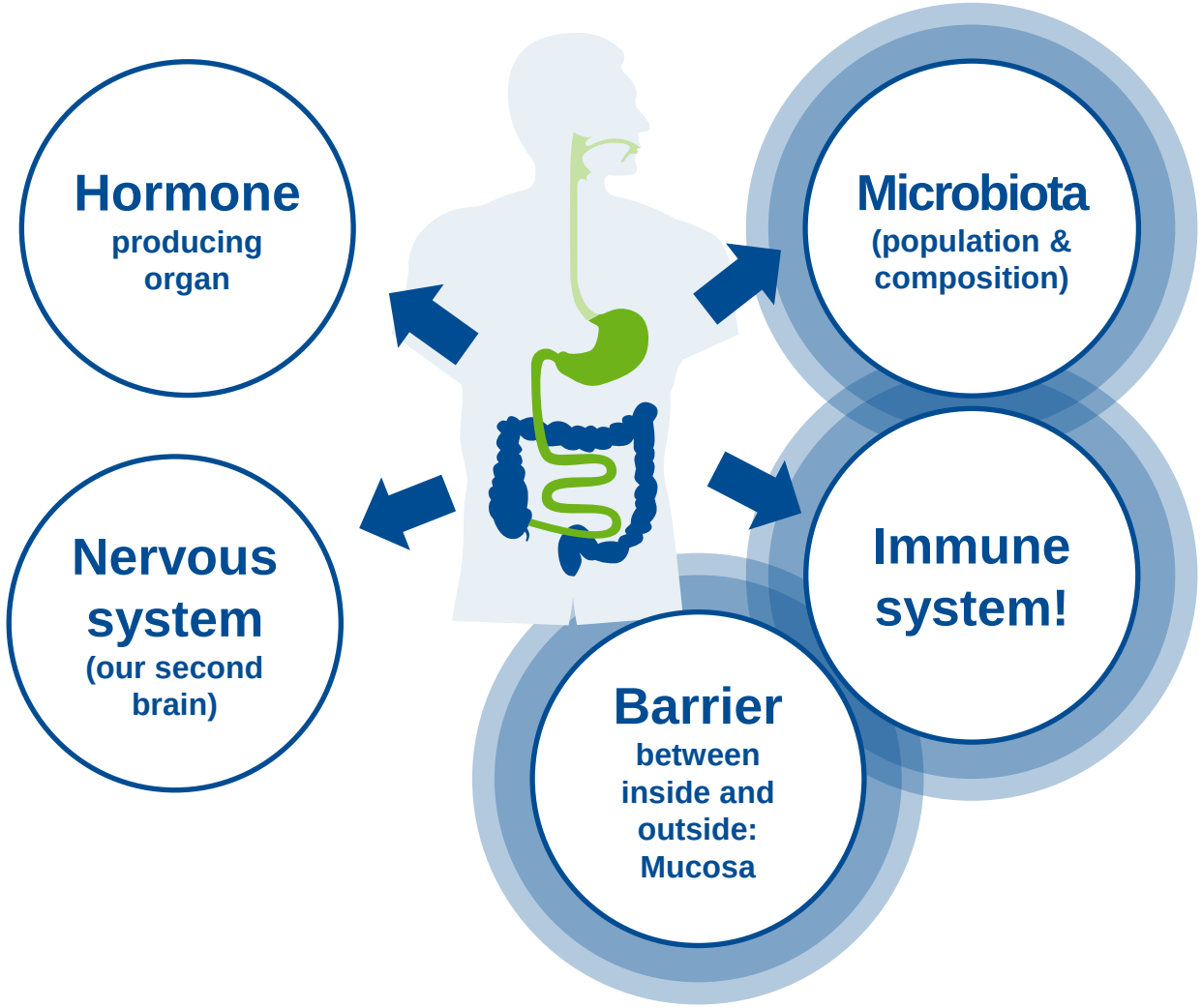


"The Chinese government and first-line medical staff accept the importance of the role of gut microbiota in COVID-19-infection" (Gao et al 2020)

International Scientific Association for Probiotics and Prebiotics (ISAPP) Science Blog by Prof Glenn Gibson, The University of Reading, UK, published on 18th Mar 2020 from https://isappscience.org/can-probiotics-and-prebiotics-go-viral/
Nutrition Society of Malaysia "Fight COVID-19 – Practise Healthy Eating" poster. http://www.nutriweb.org.my/pdf/NSM%20Covid%2019%20poster%20(rev2).pdf
Gao et al (2020) . J Dig Dis. https://onlinelibrary.wiley.com/doi/epdf/10.1111/1751-2980.12851
Zhejiang University School of Medicine, Handbook of COVID-19 Prevention and Treatment. http://www.zju.edu.cn/english/2020/0323/c19573a1987520/page.htm

Unlocking the secret of good health, well-being and a strong inner defense

The intestine – SUPER relevant for our body!

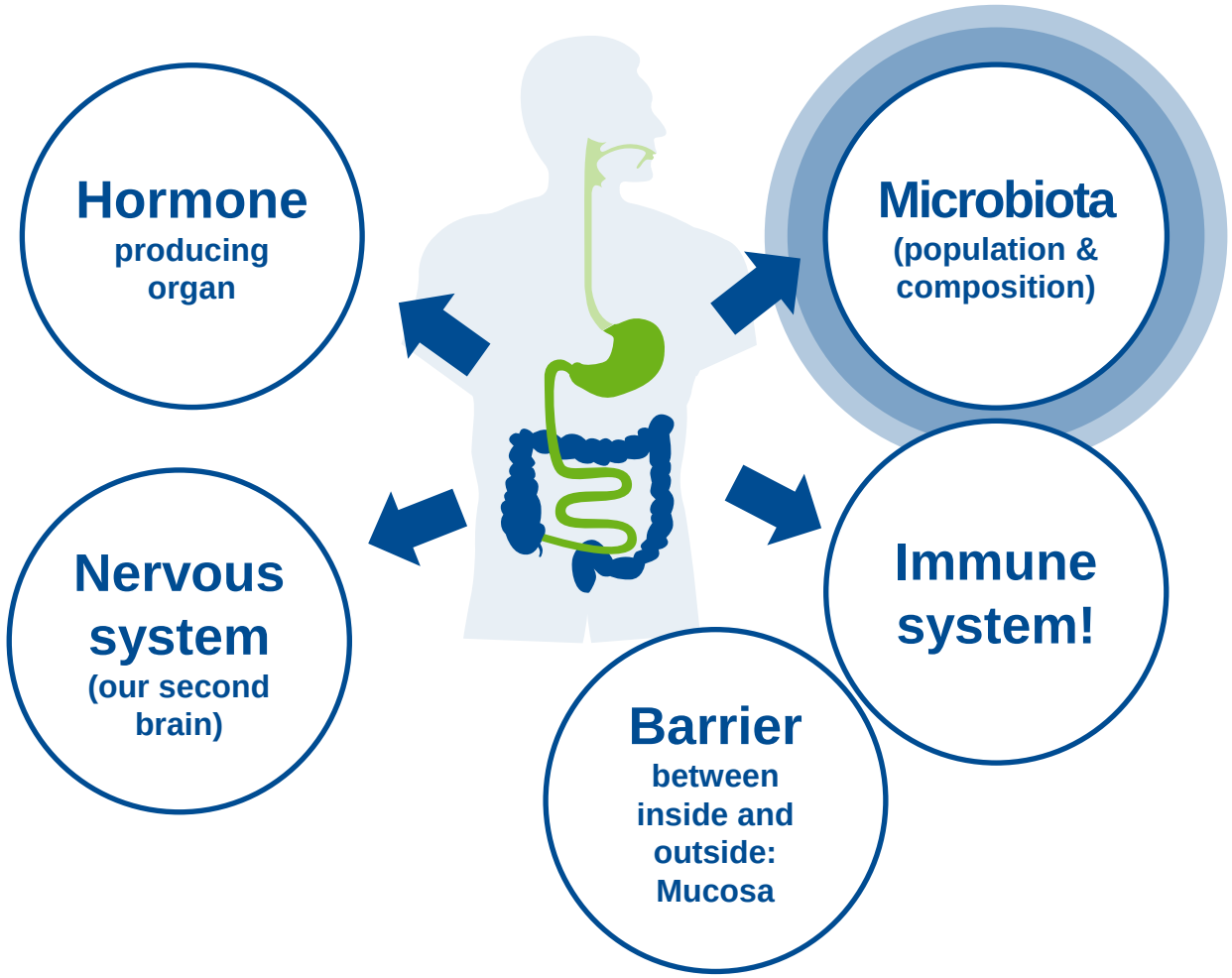


The inner defense system – our invisible body guard:

- The **immune system**, to a large extent, is based in the intestine
- Our gut **microbiota** has a relationship with this invisible body guard
- By **actively promoting the good bacteria** inside yourself, the inner defense system is strengthened
- **Prebiotics selectively promote the good bacteria to grow and support the inner defense system and a balanced gut microbiota!**
- **Chicory root fibres are clinically proven prebiotics!**

The gut microbiota is influencing everything

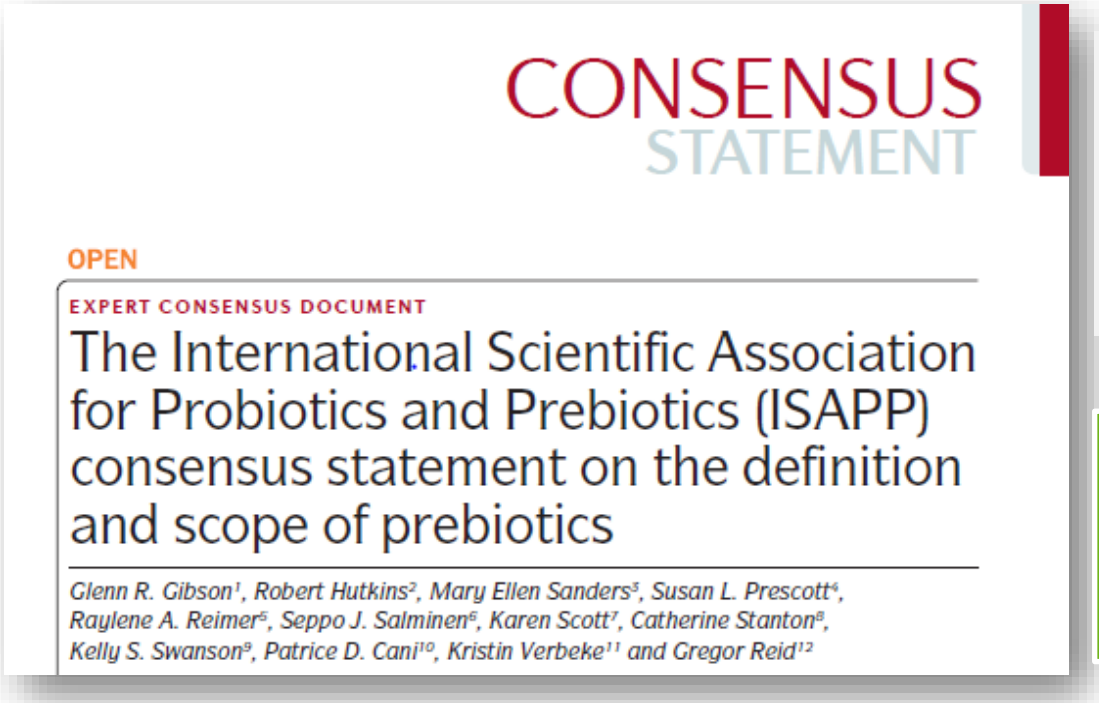
Beneficial shift in gut microbiota with prebiotic chicory root fibres



The many benefits of prebiotic chicory root fibres:

- Bowel regularity
- Inner defence/ immune health
- Blood glucose management
- Weight management
- Bone health
- …and more

Scientifically proven prebiotics as defined by the International Association for Probiotics and Prebiotics (ISAPP)


CONSENSUS STATEMENT

OPEN

EXPERT CONSENSUS DOCUMENT

The International Scientific Association for Probiotics and Prebiotics (ISAPP) consensus statement on the definition and scope of prebiotics

Glenn R. Gibson[1], Robert Hutkins[2], Mary Ellen Sanders[3], Susan L. Prescott[4], Raylene A. Reimer[5], Seppo J. Salminen[6], Karen Scott[7], Catherine Stanton[8], Kelly S. Swanson[9], Patrice D. Cani[10], Kristin Verbeke[11] and Gregor Reid[12]

ISAPP latest scientific definition of prebiotics:

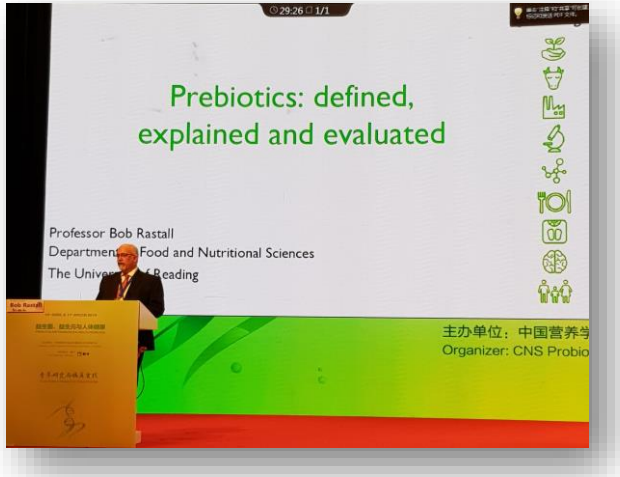
A substrate that is selectively utilised by host microorganisms conferring a health benefit

- Selectivity
- Leading to health benefits to the host
- Amount and quality of studies

Gibson et al (2017) Nat Rev Gastroenterol Hepatol. 14(8):491-502. https://www.nature.com/articles/nrgastro.2017.75
ISAPP: International Scientific Association for Probiotics and Prebiotics

Scientifically proven or not proven prebiotics?

Chicory root fibres – the only proven, natural, plant-based prebiotics



Professor Bob Rastall
University of Reading, UK
Professor Rastall presented on "Prebiotics: defined, explained and evaluated" on 21st Sep 2019
11th Asia Pacific Conference on Clinical Nutrition (APCCN) and 14th China Nutrition Science Congress (CNSC) in Nanjing, China

Reported prebiotic carbohydrates

History of the prebiotic research

BENEO is a pioneer in prebiotics since the 1990s

BENEO has supported prebiotics and gut microbiota research for over 20 years

1995

The prebiotic concept was born [1]

Research started with chicory root fibres (inulin, oligofructose)

2004

The prebiotics definition is reviewed by the International Scientific Association for Probiotics and Prebiotics (ISAPP) and consensus statements were developed to reflect the latest scientific developments

2008

In 2010, the prebiotic effect is a well-established scientific fact [2]

2010

In 2017, the latest scientific definition of prebiotics was published [3]

2017

In 2020, the latest synbiotics definition was published [4]

2020

In 2021, the scientific definition of prebiotics was published by the Chinese Nutrition Society (CNS) [5]

2021

1 Gibson and Roberfroid (1995) J Nutr 125(6): 1401–1412. https://www.ncbi.nlm.nih.gov/pubmed/7782892
2 Roberfroid et al. (2010) Br J Nutr 104(S2):S1-S63. https://www.ncbi.nlm.nih.gov/pubmed/20920376
3 Gibson et al (2017) Nat Rev Gastroenterol Hepatol. 14(8):491-502. https://www.nature.com/articles/nrgastro.2017.75
4 Swanson et al (2020) Nat Rev Gastroenterol Hepatol. 17(11):687-701. https://pubmed.ncbi.nlm.nih.gov/32826966/
5 Chinese Nutrition Society (CNS) expert scientific consensus on prebiotics definition. https://www.cnsoc.org/ysjysynews/452120205.html

Prebiotic chicory root fibres (oligofructose, inulin)

Chicory plants

Chicory root fibres (oligofructose, inulin) are extracted using hot water from the roots of chicory plants

Our gut microbiota is influencing everything

Beneficial shift in gut microbiota with prebiotic chicory root fibres

The many benefits of prebiotic chicory root fibres (inulin, oligofructose/FOS):

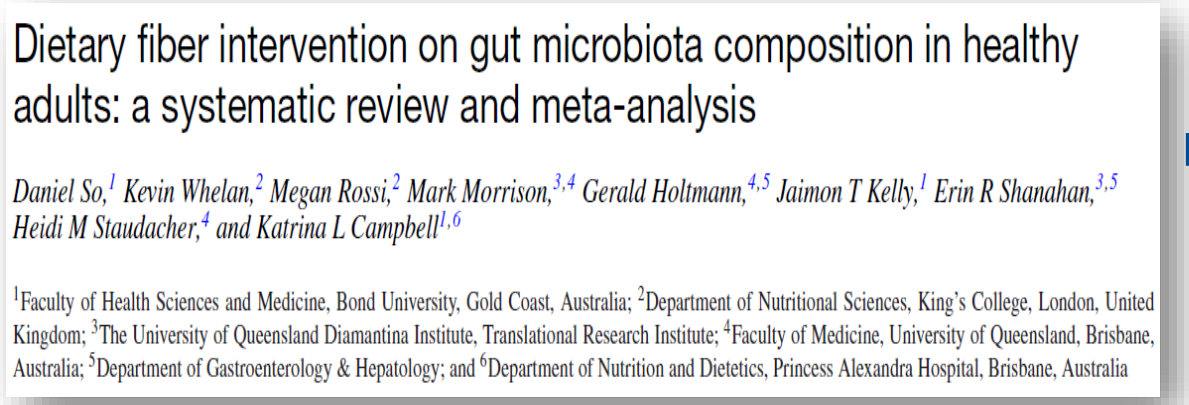
- Increase beneficial Bifidobacteria
- Digestive health and well-being
- Blood glucose management
- Inner defence
- Calcium absorption for bone health
- Weight management
- …and more

Strong body of scientific evidence for prebiotic chicory root fibres

- The selective fermentation of chicory root fibres by beneficial bacteria, such as *Bifidobacterium*, is a scientifically proven fact
  - **Over 70 studies in adults, infants and children**
  - Covering relevant factors including:

Ethnic group	Age	Gender
Health conditions	Colon site	Food matrix
Intervention duration	Intake levels	Diet conditions

Systematic reviews on the effect of prebiotic interventions on the gut microbiota

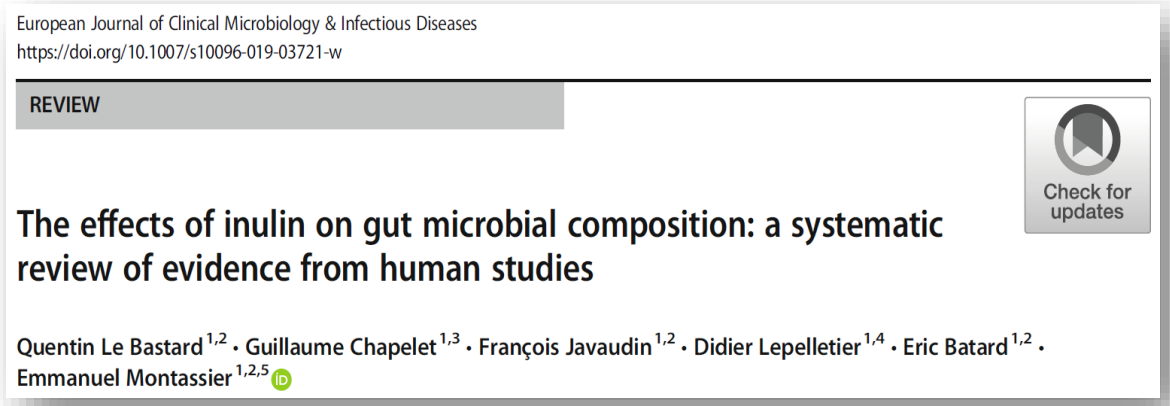


Dietary fiber intervention on gut microbiota composition in healthy adults: a systematic review and meta-analysis

Daniel So,[1] Kevin Whelan,[2] Megan Rossi,[2] Mark Morrison,[3,4] Gerald Holtmann,[4,5] Jaimon T Kelly,[1] Erin R Shanahan,[3,5] Heidi M Staudacher,[4] and Katrina L Campbell[1,6]

[1]Faculty of Health Sciences and Medicine, Bond University, Gold Coast, Australia; [2]Department of Nutritional Sciences, King's College, London, United Kingdom; [3]The University of Queensland Diamantina Institute, Translational Research Institute; [4]Faculty of Medicine, University of Queensland, Brisbane, Australia; [5]Department of Gastroenterology & Hepatology; and [6]Department of Nutrition and Dietetics, Princess Alexandra Hospital, Brisbane, Australia

Intake of fructans or galacto- oligosaccharides lead to significantly greater counts of *Bifidobacterium* spp. and *Lactobacillus* spp. They are thus acknowledged as accepted prebiotics in contrast to many other candidate prebiotics for which a significant increase of these bacteria is not proven.



European Journal of Clinical Microbiology & Infectious Diseases
https://doi.org/10.1007/s10096-019-03721-w

REVIEW

Check for updates

The effects of inulin on gut microbial composition: a systematic review of evidence from human studies

Quentin Le Bastard[1,2] · Guillaume Chapelet[1,3] · François Javaudin[1,2] · Didier Lepelletier[1,4] · Eric Batard[1,2] · Emmanuel Montassier[1,2,5]

The most consistent effect of inulin intake was in all studies an increase in the relative abundance of bifidobacteria using high-throughput methods.

So et al (2018) Am J Clin Nutr 107: 965–983. https://www.ncbi.nlm.nih.gov/pubmed/29757343
Le Bastard et al (2020) Eur J Clin Microbiol 39(3): 403-413. https://www.ncbi.nlm.nih.gov/pubmed/31707507

Immune system support by Orafti® prebiotics

- Strengthening inner defence in children
- Reducing negative effects antibiotics
- Strengthening the gut barrier
- Nourishing the gut mucosa
- Autoimmune disorders (type 1 diabetes, inflammatory bowel disease)
- Reducing infections of pathogens
- Reducing inflammation
- Greater antibody response during vaccination

Schroeder et al. (2018) Cell Host Microbe 23(1):27-40.e7. https://www.ncbi.nlm.nih.gov/pubmed/29276171
Zou et al. (2018) Cell Host Microbe 23(1):41-53.e4. https://www.ncbi.nlm.nih.gov/pubmed/29276170

Ho et al (2019) J Clin Endocrinol Metab, 104(10):4427-4440. https://www.ncbi.nlm.nih.gov/pubmed/31188437

Vogt et al (2015) Crit Rev Food Sci Nutri, 55(3):414-36. https://pubmed.ncbi.nlm.nih.gov/24915372/
Lindsay et al (2006) Gut, 55(3): 348–355. https://pubmed.ncbi.nlm.nih.gov/16162680/
Furrie et al (2005) Gut, 54(2):242-9. https://pubmed.ncbi.nlm.nih.gov/15647189/

Lewis et al (2005) Clin Gastroenterol Hepatol, 3 (5): 442–448.https://www.cghjournal.org/article/S1542-3565(04)00677-9/abstract
Cummings et al (2001) Aliment Pharmacol Ther, 15(8):1139-1145. https://pubmed.ncbi.nlm.nih.gov/11472316/
Macfarlane et al (2013) Aliment Pharmacol Ther, 38(7):804-16. https://pubmed.ncbi.nlm.nih.gov/23957631/

Lomax et al (2015) Front Immunol, 6:490. https://pubmed.ncbi.nlm.nih.gov/26441994/
Bomhof et al (2018) Eu J Nutr; 58(4):1735-1745. https://link.springer.com/article/10.1007/s00394-018-1721-2
Parnell et al (2017) Obesity (Silver Spring, Md), 25:510–513. https://pubmed.ncbi.nlm.nih.gov/28229548/

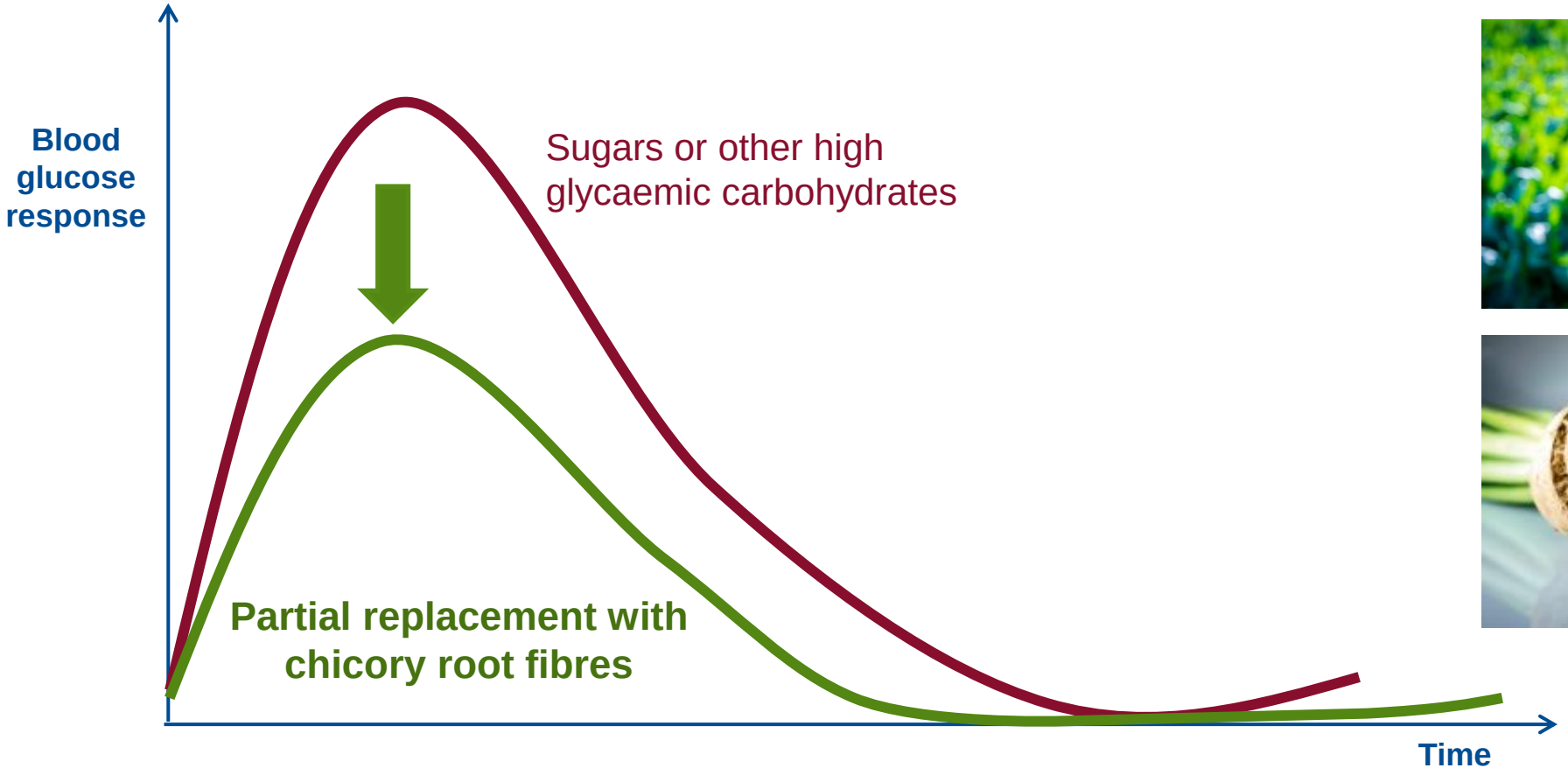
Soldi et al. (2019) Benef Microbes 10(3):253-263. https://www.ncbi.nlm.nih.gov/pubmed/30776899

Lohner et al. (2018) J Nutr 102(Suppl 2):261. https://academic.oup.com/jn/advance-article/doi/10.1093/jn/nxy120/5048772

Neumer et al (2021) Nutrients 13(4):1276. https://www.mdpi.com/2072-6643/13/4/1276

Sugar reduction with chicory root fibres lower blood glucose

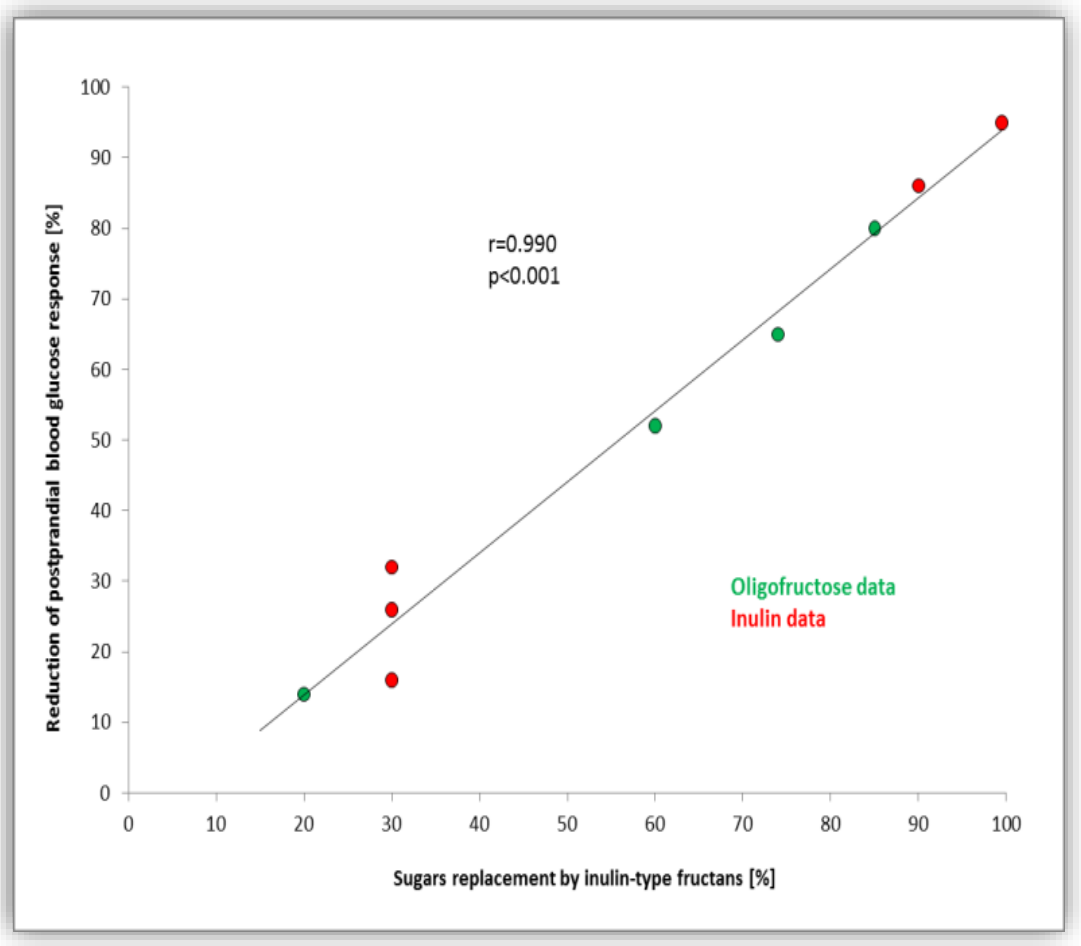
No impact on blood glucose and insulin levels as chicory root fibres are not digestible



Lightowler et al. (2018) Eur J Nutr;57(3):1259-1268 . Available from https://www.ncbi.nlm.nih.gov/m/pubmed/28255654

Review of human intervention studies continues to confirm
Sugar reduction with chicory root fibres lower blood glucose

- Sugar reduction with chicory root fibres (inulin, oligofructose) on blood glucose and insulin response has been studied in:
  - **9 human trials**
    - In both normal and overweight subjects
    - In different product applications
- Results show that the **more sugar is replaced with chicory root fibres**, the **lower the blood glucose and insulin response**
- **20% sugar replacement already shows a significant effect**



All studies show a reduced blood glucose response with chicory root fibres

Lightowler et al. (2018) Eur J Nutr;57(3):1259-1268 . Available from https://www.ncbi.nlm.nih.gov/m/pubmed/28255654

Do BENEO ingredients work in a real-life situation?
Citizen science approach

‘Citizen Science’ is a form of research collecting large quantities of data involving persons of the general population in scientific research projects and study them in their real-life situation in a retrospective way.

N= 117

start

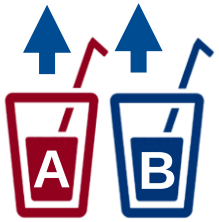
Continuous glucose monitoring

end

11-day Orafti®Synergy1 intervention (10 g/d)

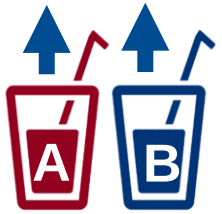
(10 g/d Orafti®Synergy1 from day 4 onwards with dinner)

stool sample



= 2x 30g/d Palatinose™ or sucrose*

After 1 day of sensor calibration, the participants took in test drink A on days 2, 7, and 12, as well as test drink B on days 3, 8, and 13 (30g/d with breakfast, 30g/d with lunch)



post-study survey

stool sample

Outcome measures:

- 14-day continuous glucose response (CGMS)
- Gut microbiota (16S rRNA sequencing)
- Food intake (14-day food diary)

*Dissolved in 250 ml water and applied in a double-blind way

Kordowski et al. (2022) Palatinose™ (Isomaltulose) and Prebiotic Inulin-Type Fructans Have Beneficial Effects on Glycaemic Response and Gut Microbiota Composition in Healthy Volunteers—A Real-Life, Retrospective Study of a Cohort That Participated in a Digital Nutrition Program. Front. Nutr. 9. https://www.frontiersin.org/articles/10.3389/fnut.2022.829933/full

Outcome: improvement of blood glucose management and microbiota support with the BENEO diet!

- The effects observed were robust and not overruled by the habitual diet and usual lifestyle
- The beneficial characteristics of Palatinose™ compared to sucrose were confirmed in a real-life situation:
  - Lower blood glucose response
  - Lower and more balanced (lower variability) blood glucose profile for the day
  - Slow release and sustained glucose supply
- The decrease in glycaemic variability over time was further improved significantly with the daily intake of 10g of prebiotic fibre oligofructose-enriched inulin (Orafti®Synergy1)
- The decrease in variability over time with Orafti® Synergy 1 was irrespective of the carbohydrate consumed and therefore is synergistic to the Palatinose™ effects observed
- The support of the gut microbiota was evidenced by a significant increase in Bifidobacteria
- The contribution to better health by the functional ingredients Palatinose™ and Orafti® Synergy 1 was clearly demonstrated

Kordowski et al. (2022) Palatinose™ (Isomaltulose) and Prebiotic Inulin-Type Fructans Have Beneficial Effects on Glycaemic Response and Gut Microbiota Composition in Healthy Volunteers—A Real-Life, Retrospective Study of a Cohort That Participated in a Digital Nutrition Program. Front. Nutr. 9. https://www.frontiersin.org/articles/10.3389/fnut.2022.829933/full

In summary

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Unlocking gut microbiota and blood glucose management for immune health and managing NCDs

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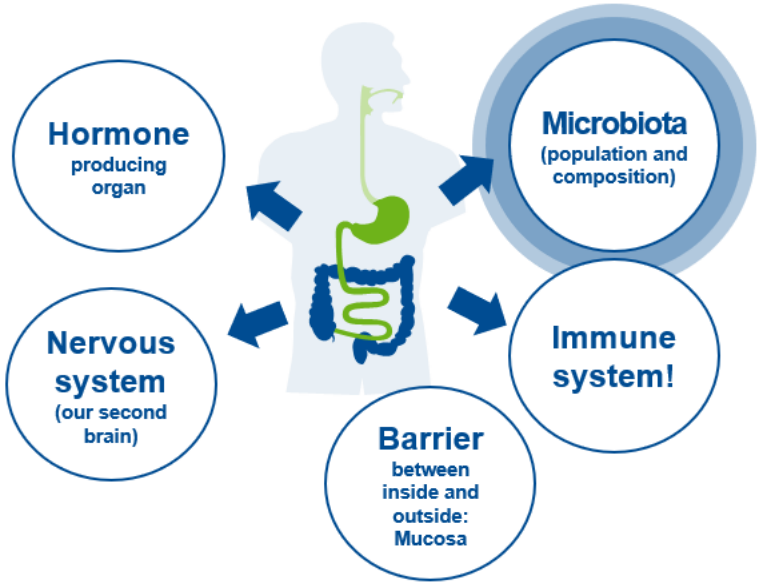
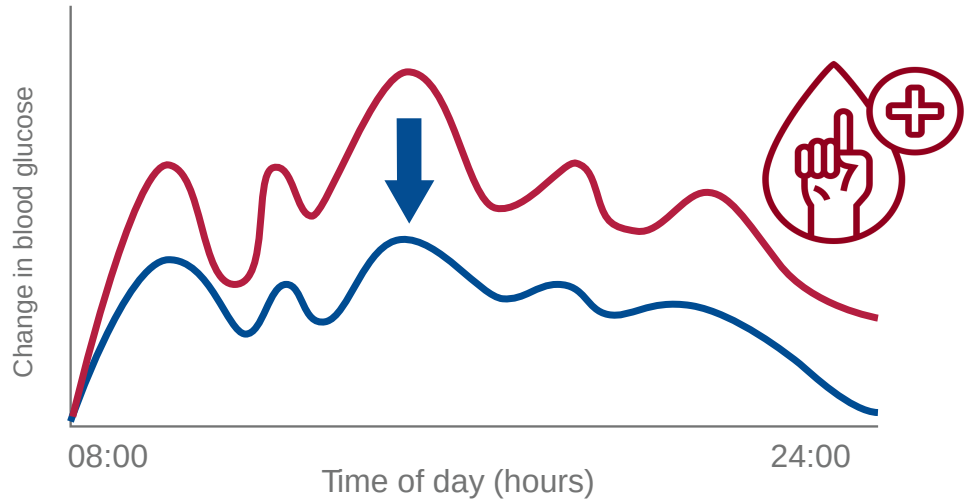
Positive influence on gut microbiota with prebiotic chicory root fibres



Supporting blood glucose management with Palatinose™, ISOMALT, chicory root fibres



The smart choice with science-based ingredients in your recipe development!

palatinose™ isomaltulose
ISOMALT
Orafti® oligofructose
Orafti® inulin

Dietary fibre and Isomaltulose websites developed for healthcare professionals

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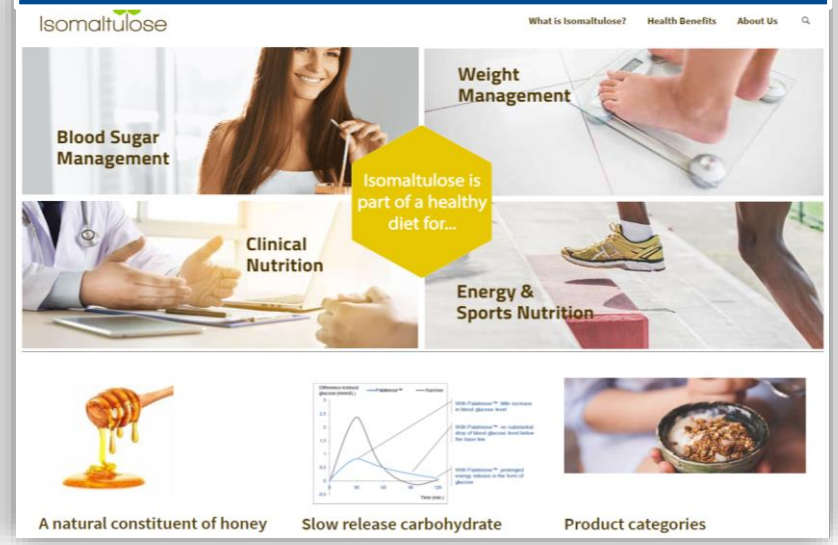
www.dietaryfiber.org

www.isomaltulose.org or www.Palatinose.org



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Thank you!

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