How nutrition can support in the fight against COVID-19

Focus: lower blood glucose profiles, support of the beneficial microbiota, gut health and inner defence mechanisms

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Overview

- Introducing BENEO and the BENEO-Institute – a science-based organisation
- The role of glycaemia in immune health and COVID-19:
  Smart ingredients for lower blood glucose
- Influence of gut microbiota in COVID-19:
  Strengthening the body's inner defence with prebiotics

The BENEO-Institute

Connecting nutrition and health

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Three pillars of expertise within the BENEO-Institute

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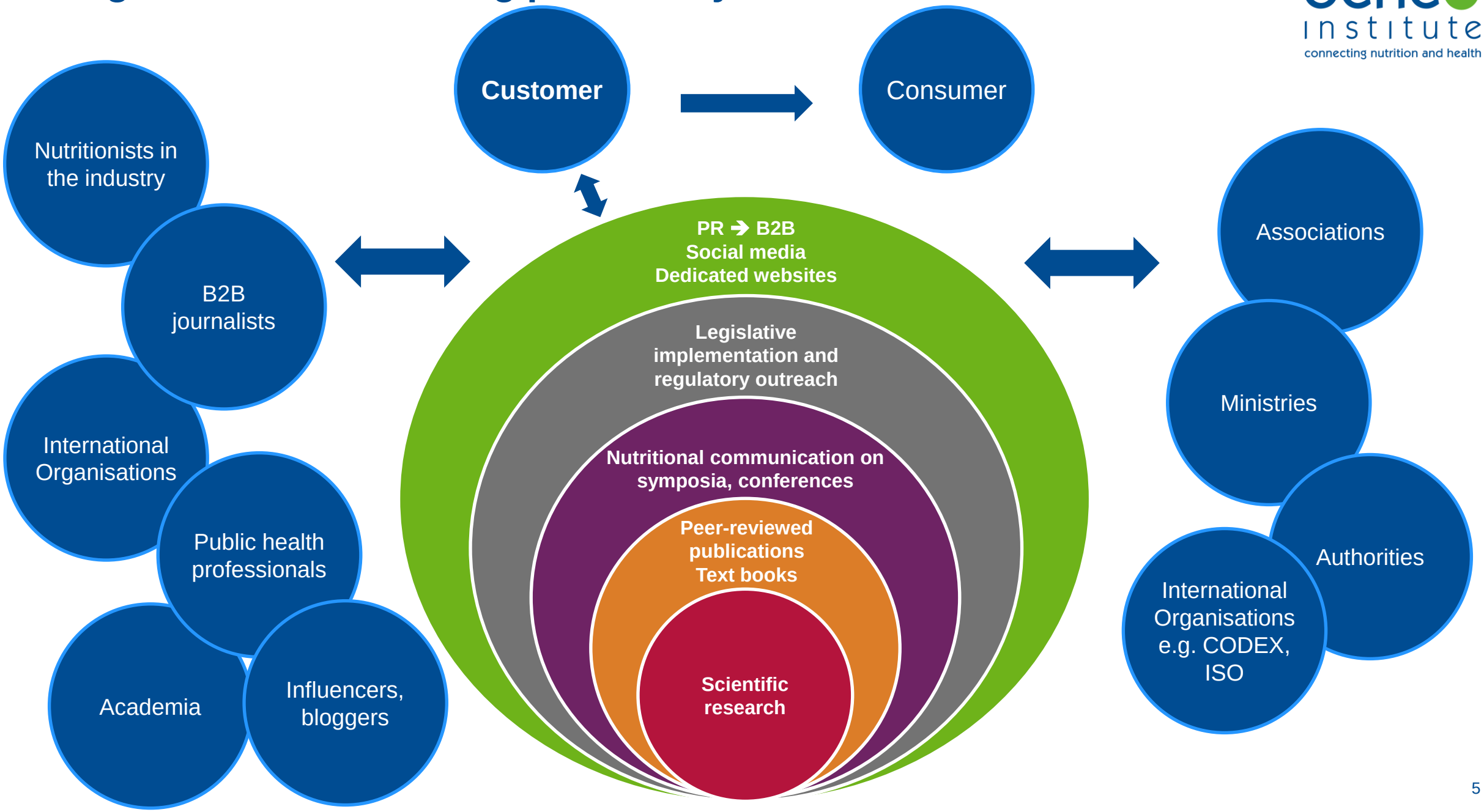
Dialogue and trust building process by the BENEO-Institute

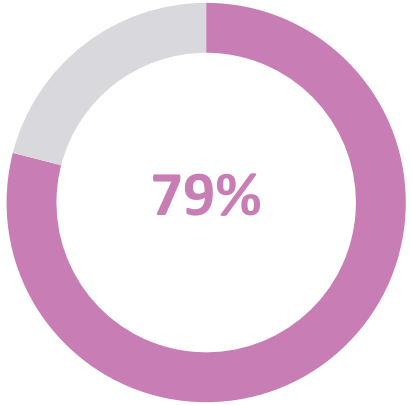


What are the health concerns of consumers in Asia Pacific?

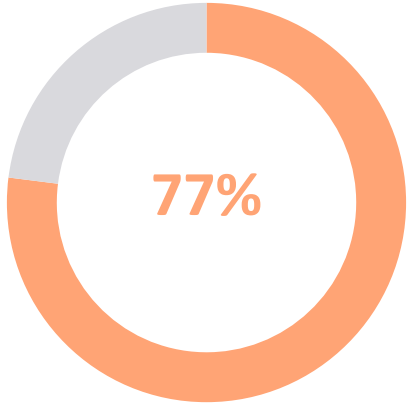
Consumer research in Asia Pacific

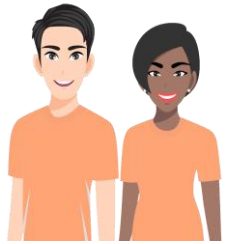
People are more attentive to immune health

To what extent do you agree with the statement "I have been more attentive to my immune health as a result of COVID-19“ – “Agree”

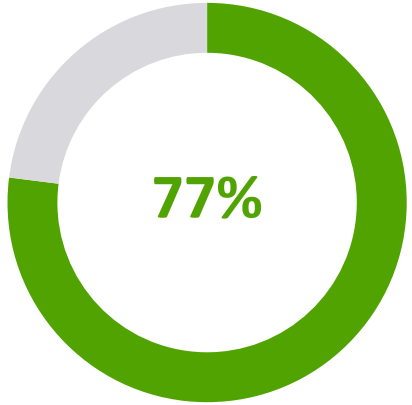


Generation Z

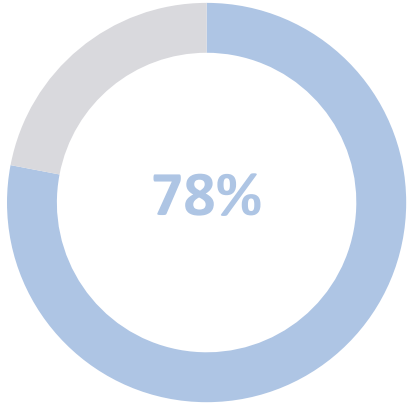




Millennials



Generation X



Baby Boomers

FMCG Gurus. Immunity Trends by Cohort – Asia Pacific. Survey conducted in 2020.

The role of glycaemia in immune health and COVID-19

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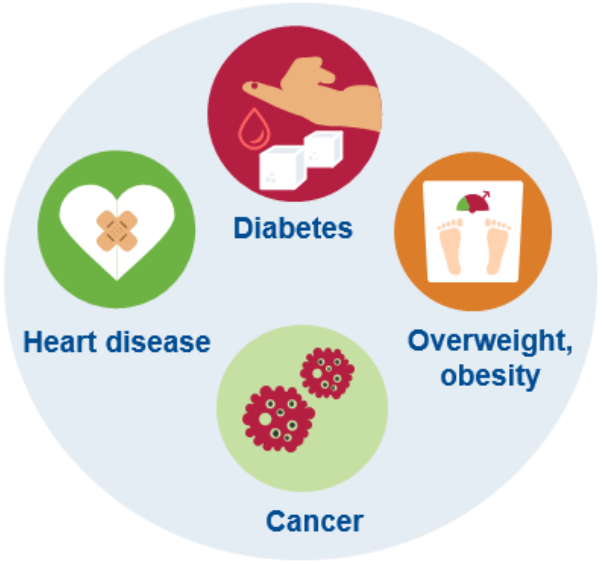
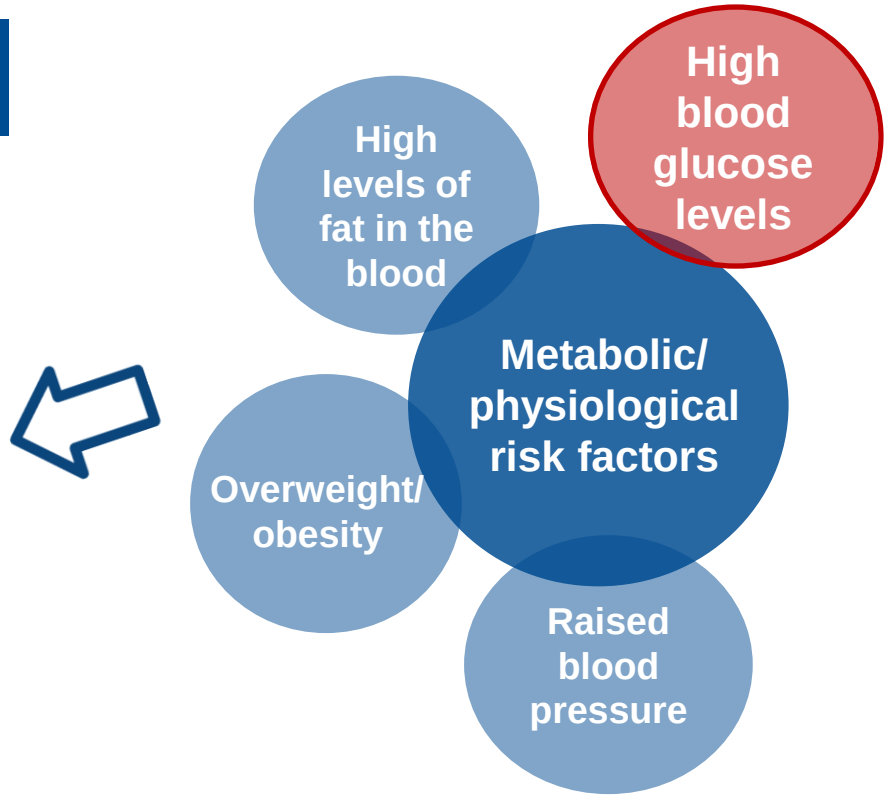
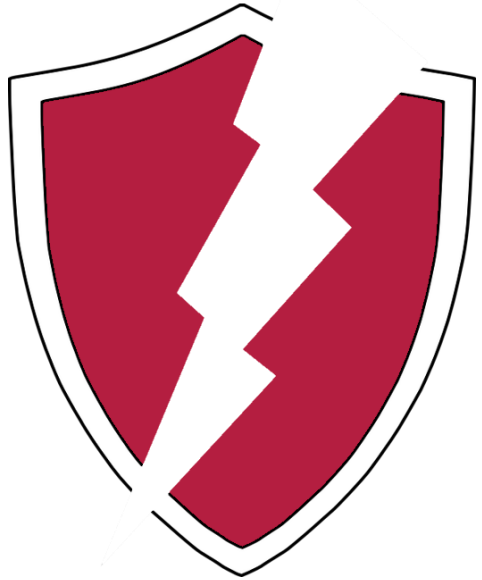
Healthy blood glucose matters –
In non-communicable diseases AND communicable diseases

Non-communicable diseases (non-infectious)





Communicable diseases (infectious)



High blood glucose, even for short-term, weakens and impairs immunity[1]

[1] Jafar et al (2016) Am J Med Sci 351(2):201-11. https://pubmed.ncbi.nlm.nih.gov/26897277/

High blood glucose weakens the immunity
Leads to more severe COVID-19 infection outcomes

Admission Hyperglycaemia in Non-diabetics Predicts Mortality and Disease Severity in COVID-19: a Pooled Analysis and Meta-summary of Literature

By Sachdeva et al 2020
Published in SN Comprehensive Clinical Medicine

Association of Blood Glucose Control and Outcomes in Patients with COVID-19 and Pre-existing Type 2 Diabetes

By Zhu et al 2020
Published in Cell Metabolism

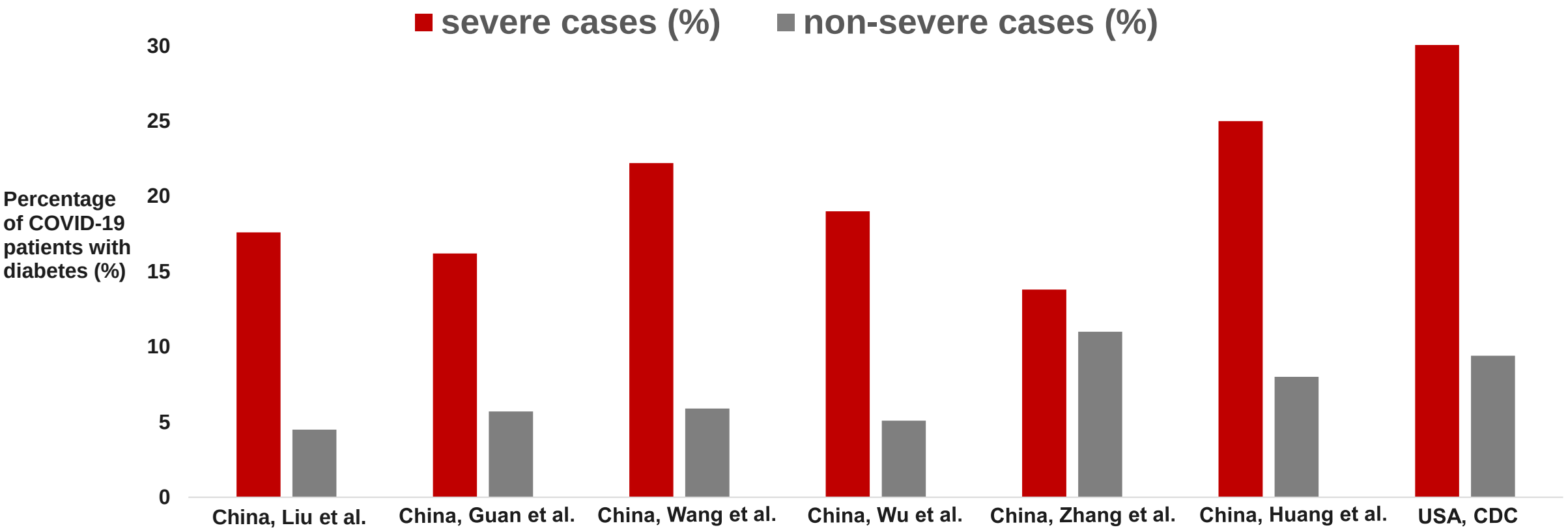
COVID-19 and Diabetes

Published in the International Diabetes Federation on 20th May 2021

- Data from around the world shows:
  - Regardless of diabetes, having **high blood glucose** leads to **more severe** COVID-19 infection outcomes
  - High blood glucose **increases inflammation** (disrupts the immune system), resulting in more severe illness
  - COVID-19 virus **thrives** in an environment of high blood glucose

Zhu et al (2020) Cell Metab, 31(6):1068-77. https://pubmed.ncbi.nlm.nih.gov/32369736/
Sachdeva et al (2020) SN Compr Clin Med. 2(11):2161-6. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7550017/
International Diabetes Federation. COVID-19 and diabetes. https://www.idf.org/aboutdiabetes/what-is-diabetes/covid-19-and-diabetes/1-covid-19-and-diabetes.html

High blood glucose in diabetes worsens the severity of COVID-19 infection



- Uncontrolled high blood glucose in diabetes worsens the severity of COVID-19 infections (red bars) as compared to well-controlled diabetes (grey bars)
- Additionally, death rate is 3 times higher in diabetic patients with COVID-19 infection

Adopted from Das et al. (2020) Life Sci 258:118202. https://pubmed.ncbi.nlm.nih.gov/32758625/ and Singh et al. (2020) Diabetes Metab Syndr 14(4):303–310. https://pubmed.ncbi.nlm.nih.gov/32298981/

Most foods eaten in Asia are medium to high glycaemic

Nutrition interventions with lower glycaemic options are needed

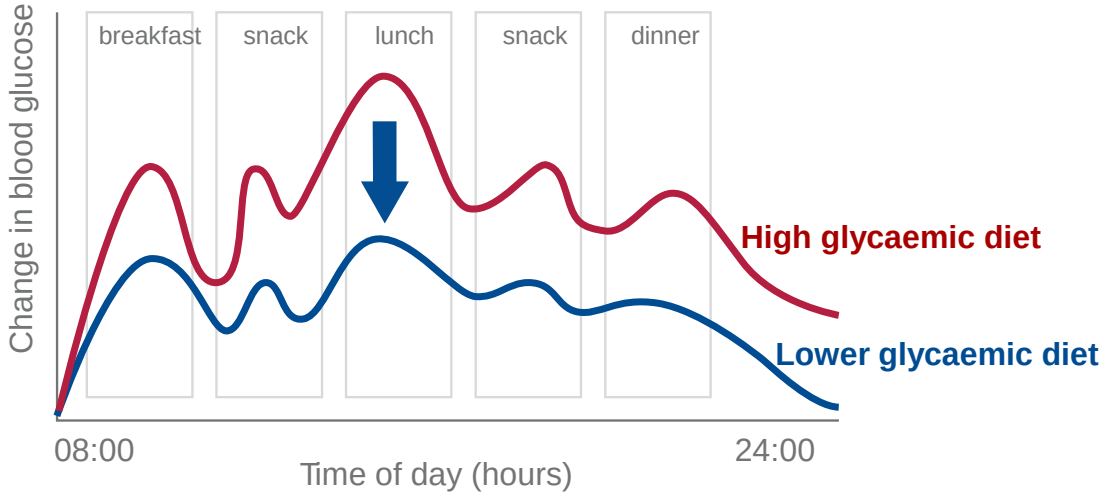
Henry et al. *Nutrition and Diabetes* (2021)11:2
https://doi.org/10.1038/s41387-020-00145-w

Nutrition & Diabetes

REVIEW ARTICLE Open Access

A glycaemic index compendium of non-western foods

Christiani Jeyakumar Henry[1,2], Rina Yu Chin Quek[1], Bhupinder Kaur[1], Sangeetha Shyam[3,4] and Harvinder Kaur Gilcharan Singh[3,5]



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

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

Smart ingredients for lower blood glucose

Palatinose™, ISOMALT, chicory root fibres

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Carbohydrates
Digestibility and blood glucose response

Glucose, Sucrose, Maltodextrin, Starch

Highly digestible, Full and fast uptake

Palatinose™ (isomaltulose)

Slowly digestible, Full and slow uptake

Fibres, Polyols (eg. ISOMALT)

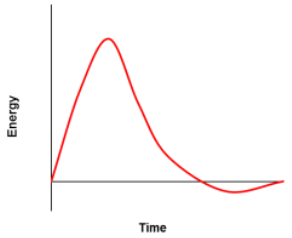
Low / non-digestible carbohydrates

Stomach

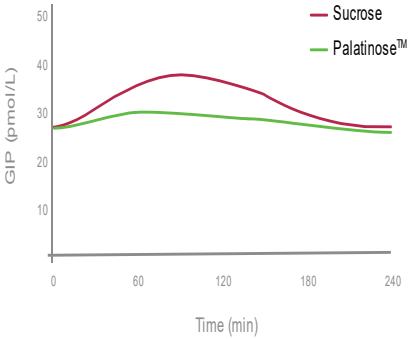
Small intestine

Large intestine

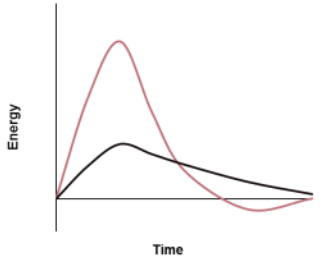
Fast, complete uptake
High glycaemic



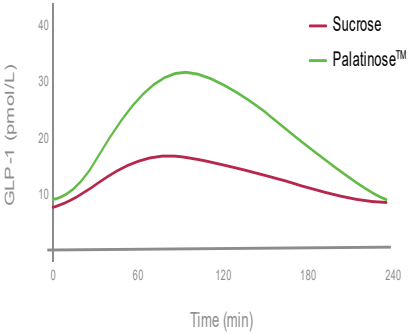
↑ GIP gut hormone



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

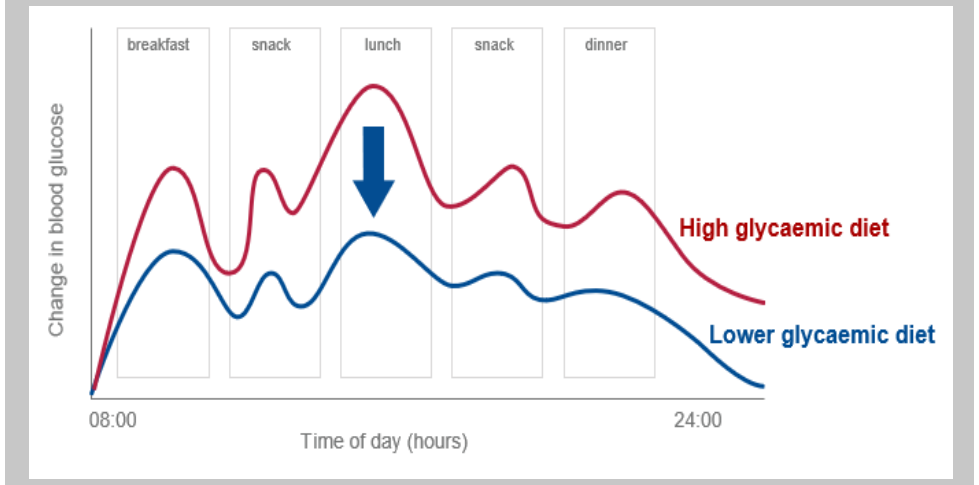
Sugar beet plants

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

From theory to practice

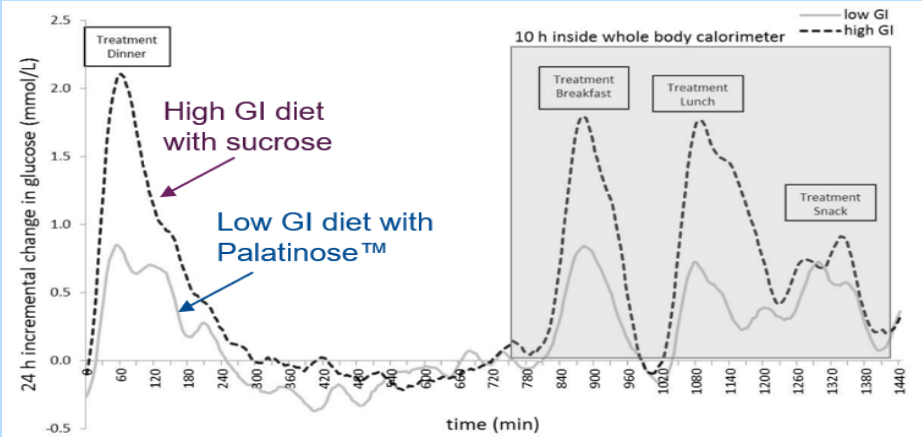
Balanced and lower blood glucose levels with Palatinose™

In theory



The proof with Palatinose™

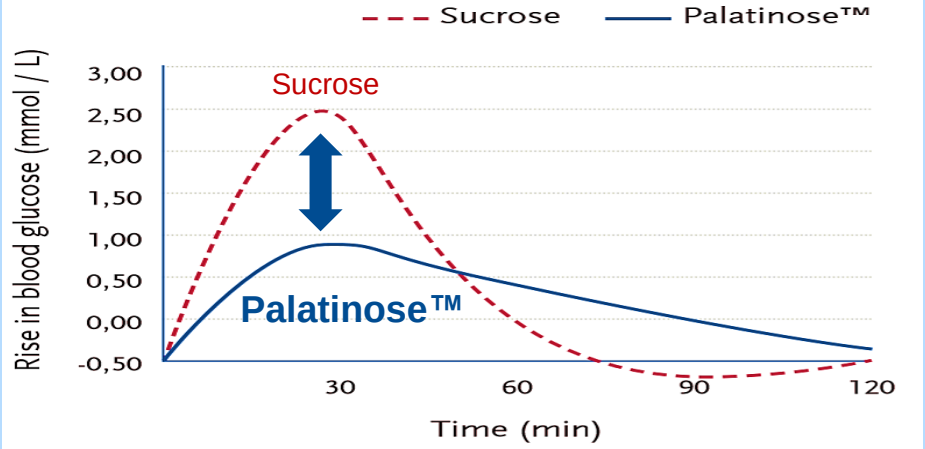
Over 24 hours



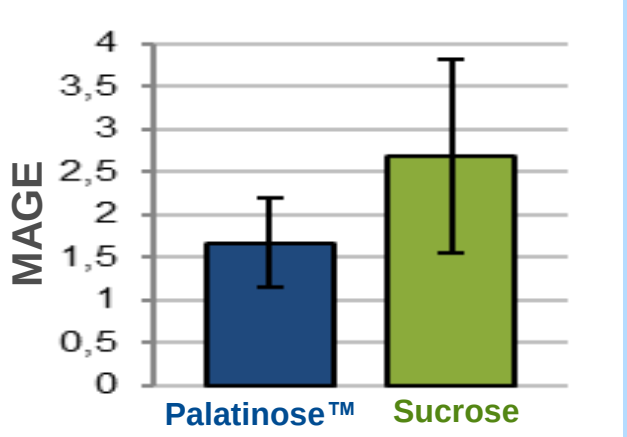
Tested in 20 healthy men using 24h continuous glucose monitoring in randomised, double-blind cross-over design.

The proof with Palatinose™

In a single intake



Balanced blood glucose (MAGE)



MAGE: Mean amplitude of glycaemic excursion

Blood glucose response is always slow and low with Palatinose™ – Confirmed in over 30 human trials

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

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)

High Glycaemic Index (GI) of Asian Diet – What are the Clinical Implications?

By Tey and Lee 2014

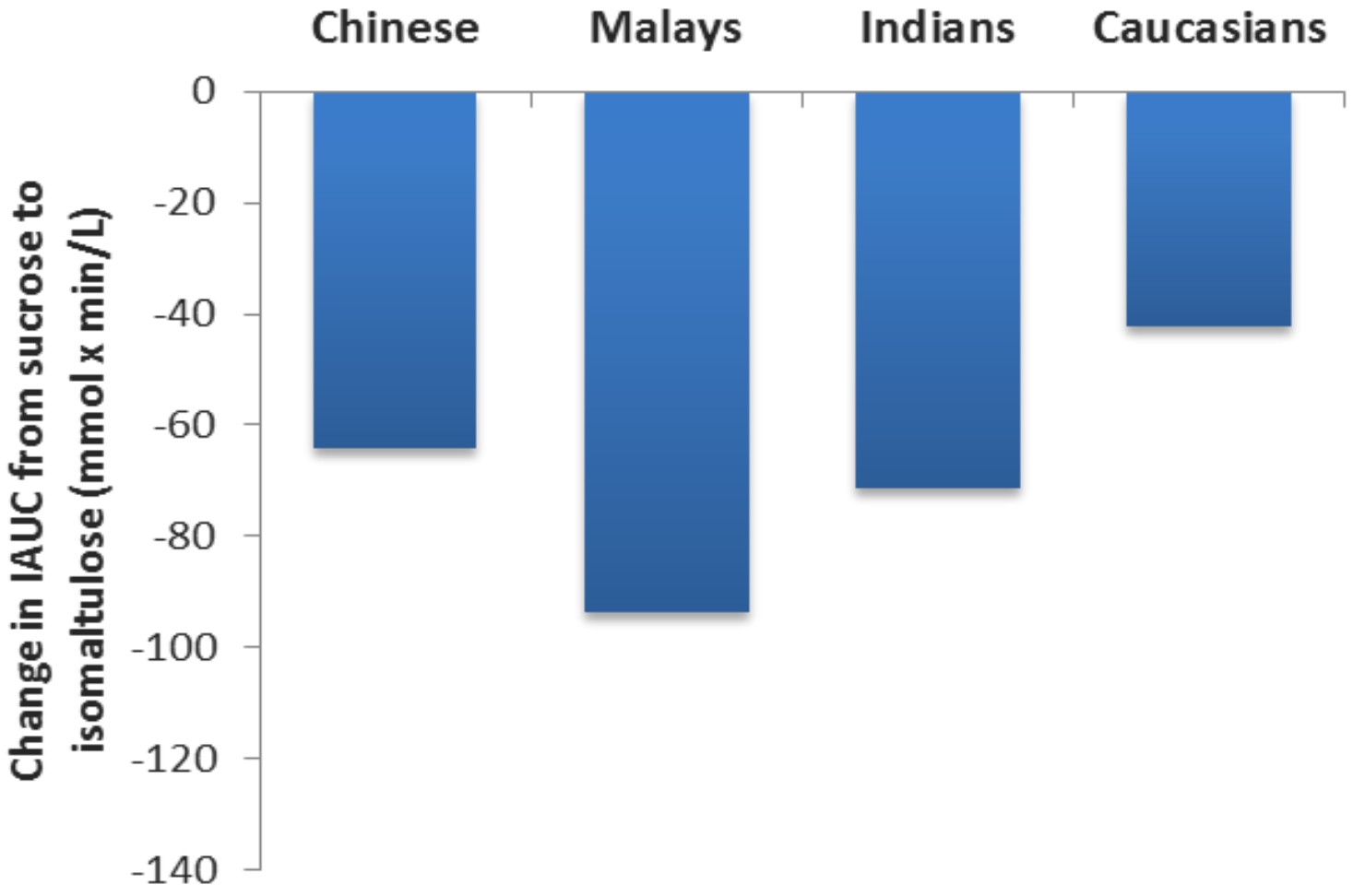
Published in Annals of the Academy of Medicine, Singapore

- 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/
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/
Jia et al (2019) Diabetes Metab Res Rev. 35(6):e3158. https://pubmed.ncbi.nlm.nih.gov/30908791/

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

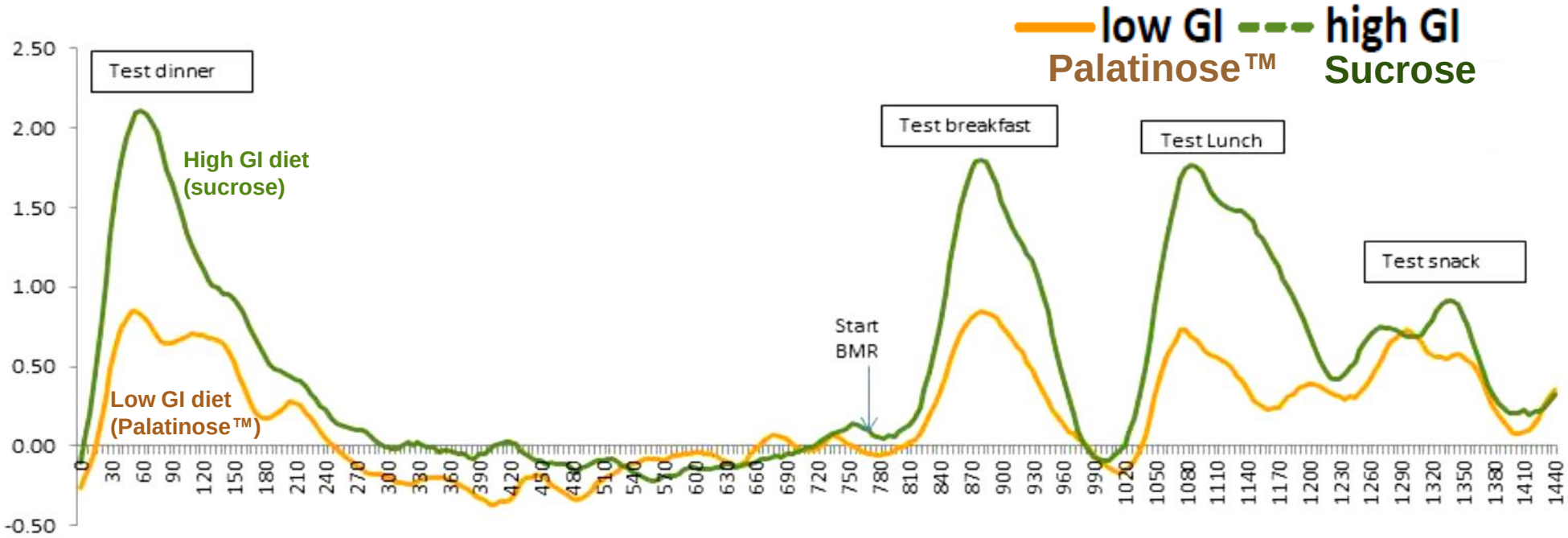
Tan et al 2017. Nutrients 9(4): 347. Open access. Available from http://www.mdpi.com/2072-6643/9/4/347

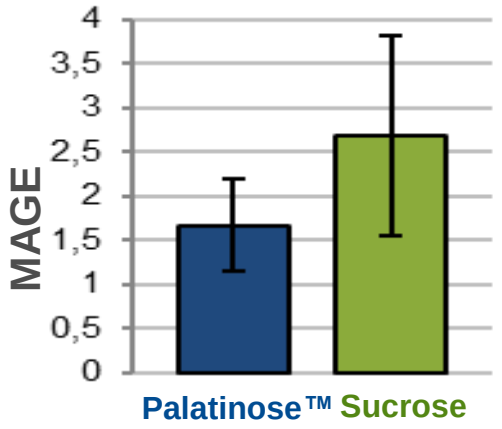
Study design: Randomised, crossed-over clinical study comparing 50g Palatinose™ versus 50g sucrose in 40 healthy adults from 4 ethnic groups.

IAUC: Incremental area under the curve for blood glucose response

Low GI diet incorporating Palatinose™

Lower and more balanced blood glucose response over 24 hours





MAGE: Mean amplitude of glycaemic excursion

- Lower blood glucose response over 24h with low GI diet (p=0.002)
- Second meal effect observed – lower blood glucose response after the same standard dinner on day 2 (p<0.05)
- Balanced blood levels over 24h (p<0.001); fewer swings in blood glucose as measured by MAGE
- Higher 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

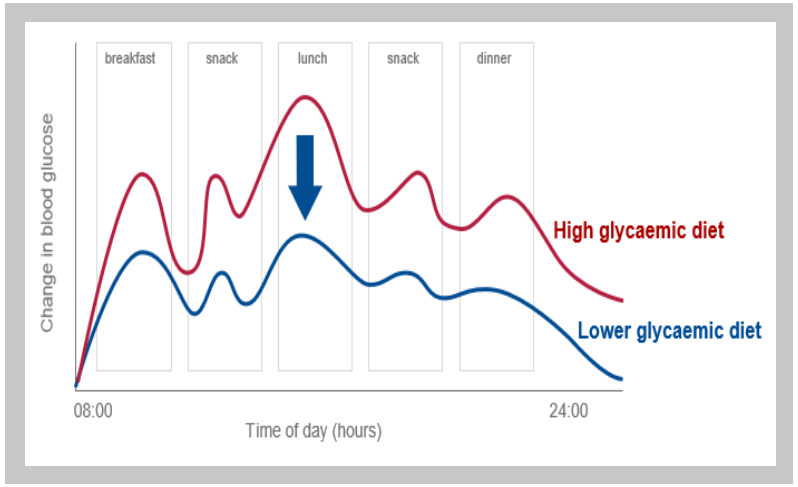
Study design: Randomised, double-blind, cross-over study comparing a low GI diet (Palatinose™) versus a high GI diet (sucrose) in 20 healthy adults aged 21-29 years old, BMI: 18-29 kg/m^2.

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.

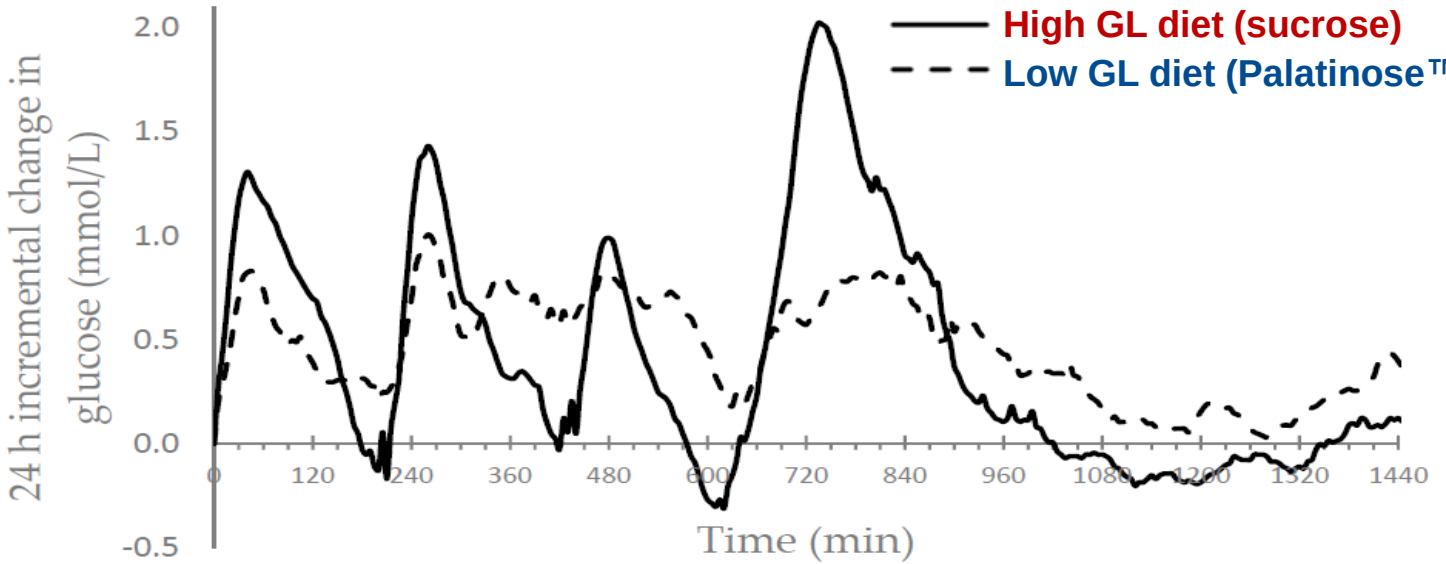
Proof of concept: The low glycaemic concept works

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

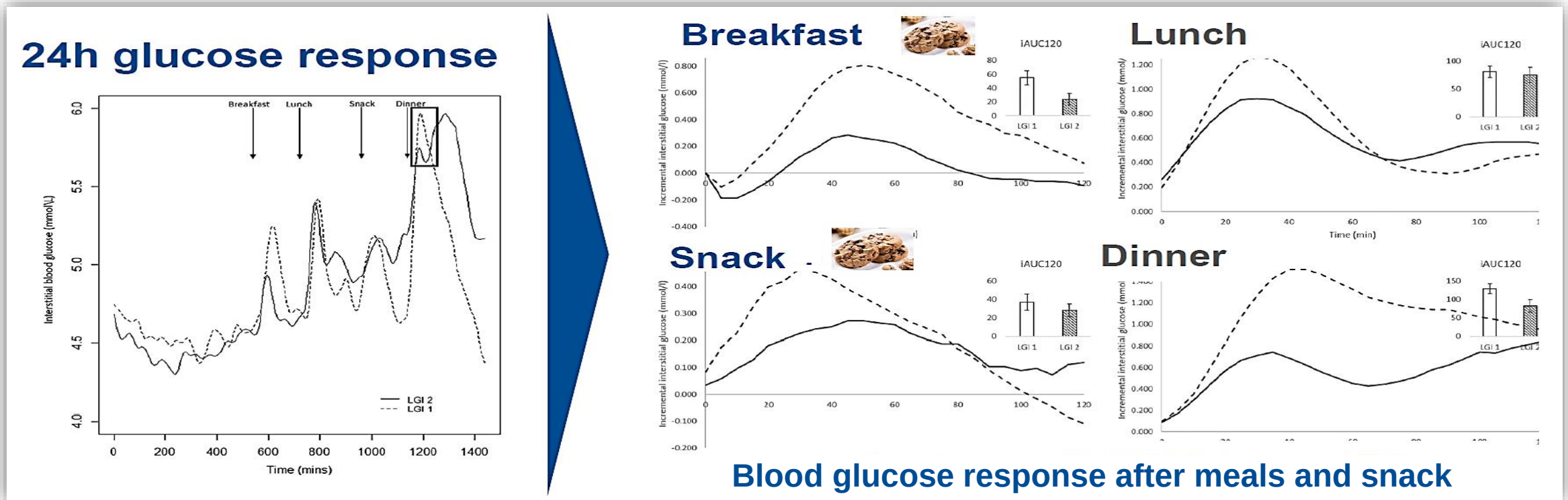
Helps you to achieve lower and more balanced blood glucose levels over the day and improve the nutritional quality of the diet

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

Reducing the GI is a simple way to improve nutritional quality



- Low GI modified biscuit (GI 24) versus basic low GI biscuit (GI 54) reduced blood glucose
  - At breakfast (↓ 56%, p=0.002); afternoon snack (↓ 24%, p=0.06); at dinner ("**second meal effect**"); reduced insulin response at breakfast (↓ 45%, p=0.02)
- **Reducing the GI value of the food is a simple way to improve its nutritional quality**

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

Study design: Randomised, single blind, placebo-controlled cross-over study in 13 healthy 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.

Plant-based smart ingredients for lower blood glucose

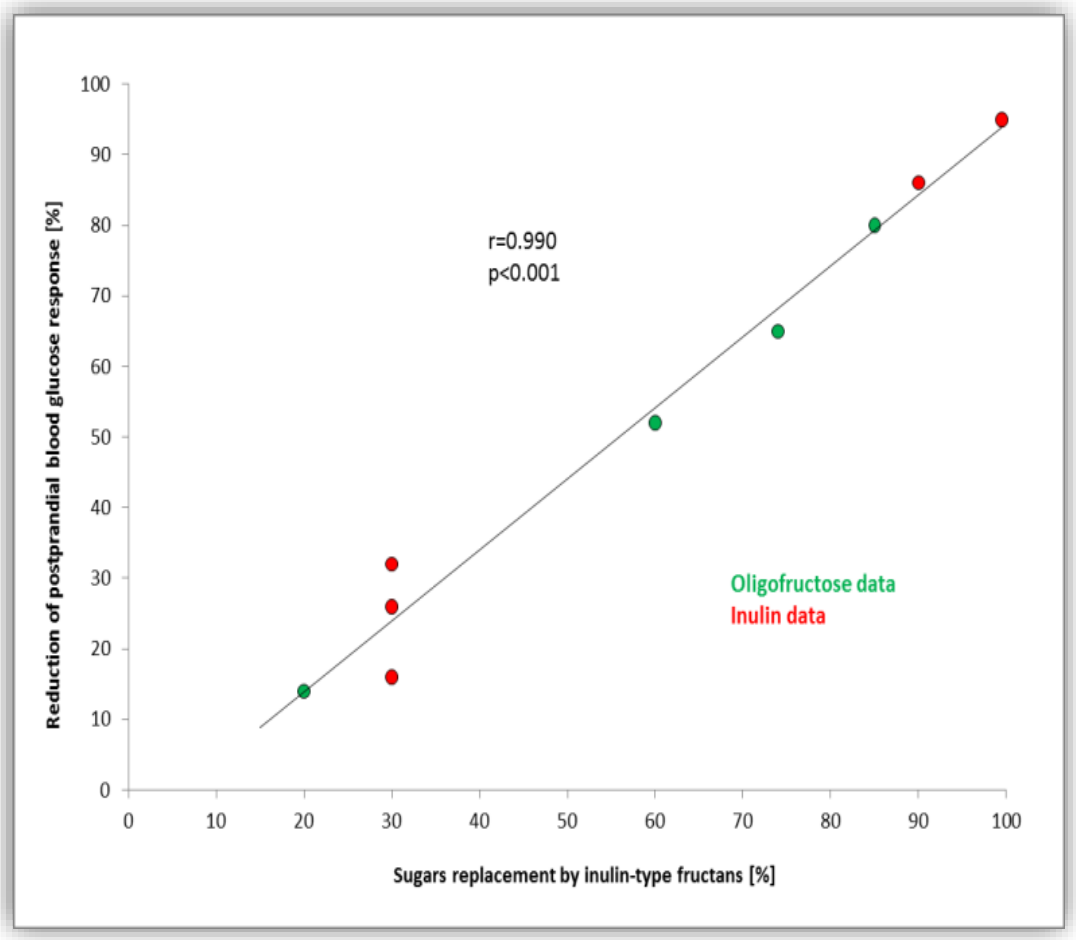
Chicory root fibres (oligofructose, inulin)

Chicory plants

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

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

Influence of gut microbiota in COVID-19

Strengthening the body’s inner defence with prebiotics

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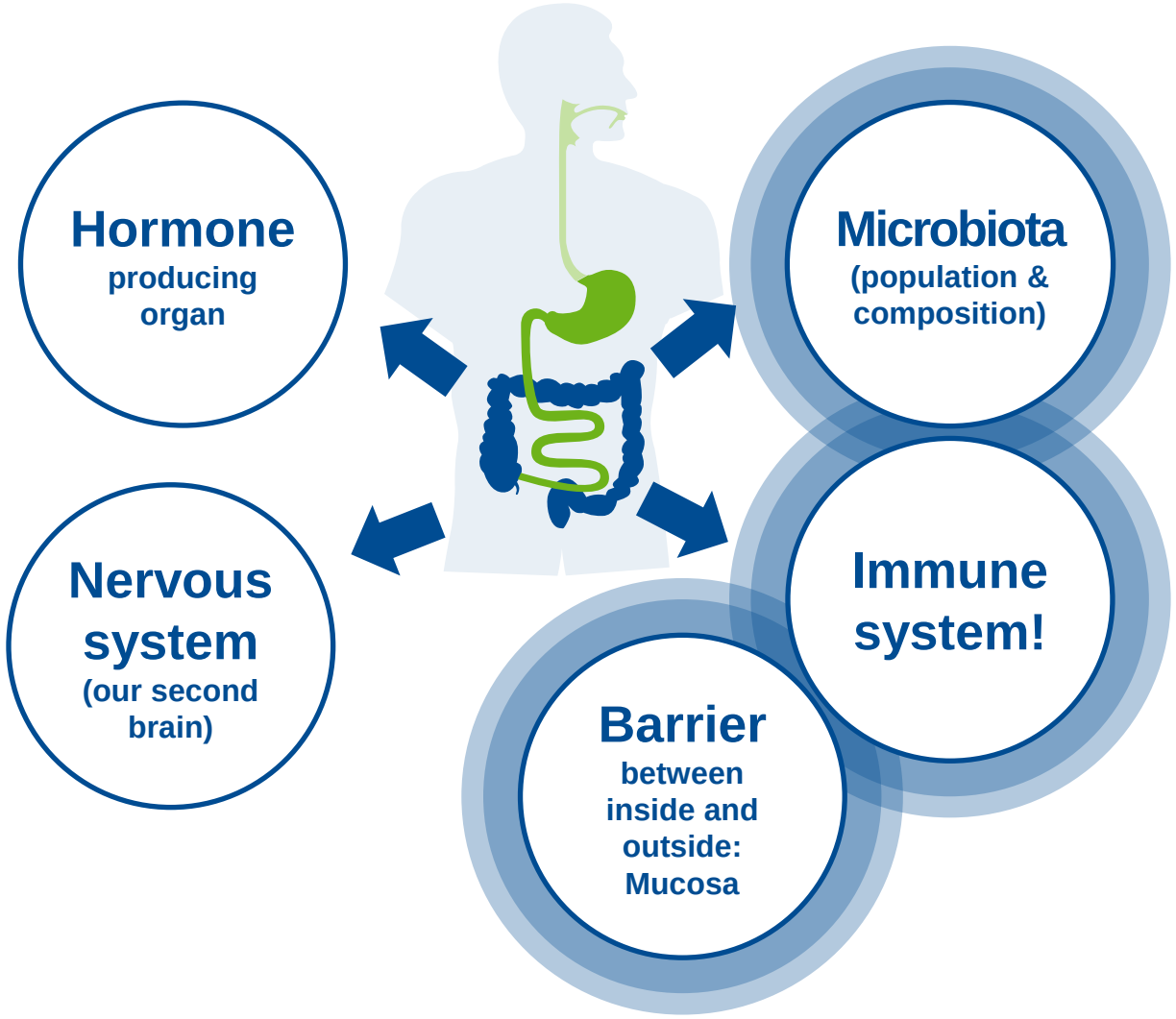
Unlocking the secret of good health, well-being and a strong inner defence

The intestine – SUPER relevant for our body!



The inner defence system – our invisible bodyguard:

- The **immune system**, to a large extent, is based in the intestine
- Our **gut microbiota** has a relationship with this invisible bodyguard
- By **actively promoting the good bacteria** inside yourself, the inner defence system is strengthened

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

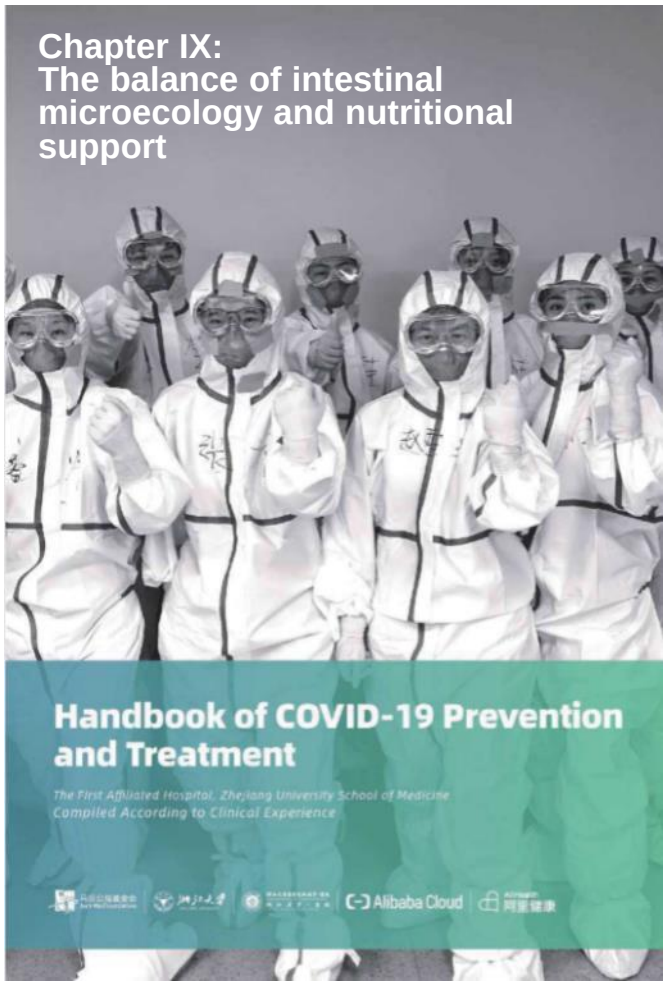
International scientific expert in prebiotic research, Professor Glenn Gibson, The University of Reading, UK

"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

Gut microbiota and COVID-19
Potential for prebiotics

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

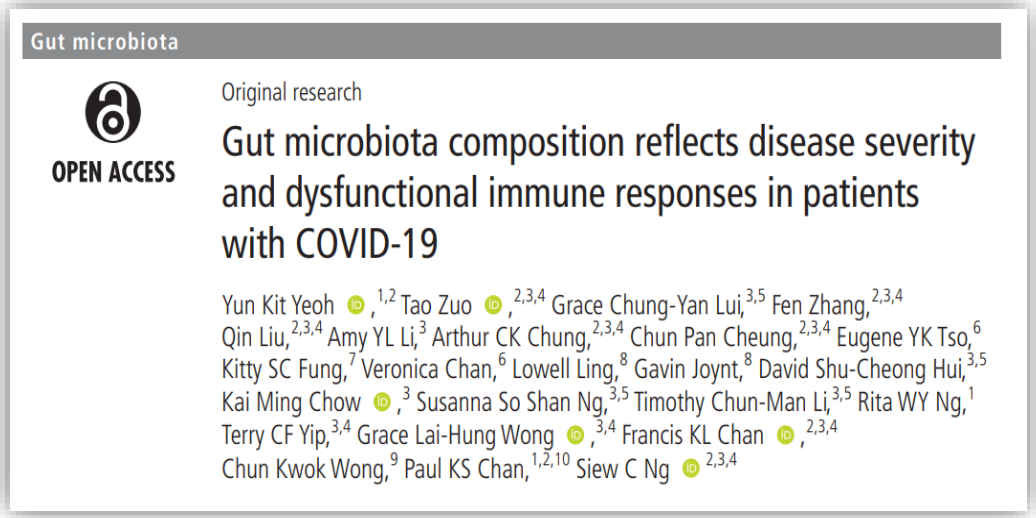
International scientific expert in prebiotic research, Professor Glenn Gibson, The University of Reading, UK

"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

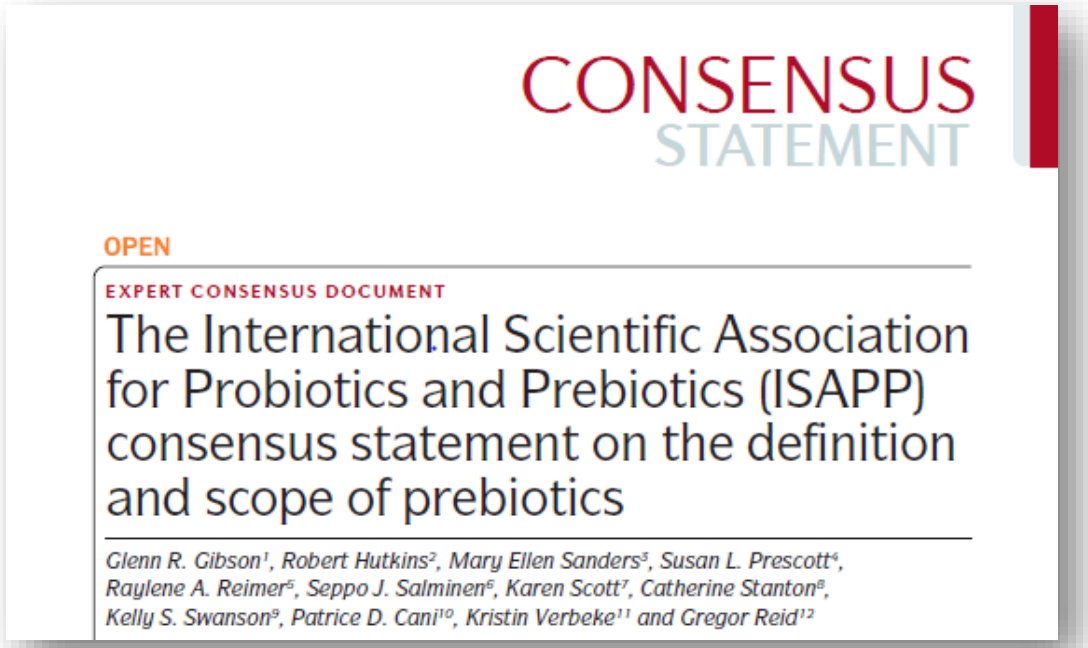
Original research

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 Professor 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/

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



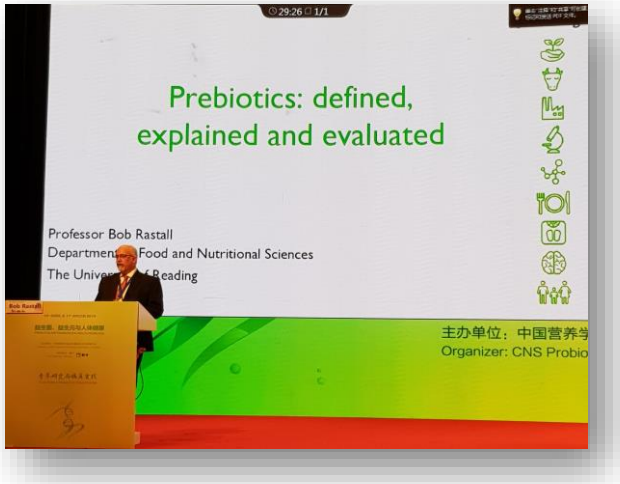
ISAPP latest scientific definition of prebiotics:

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

- Selectivity
- Leading to health benefits to the host
- Number and quality of human 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

Chicory root fibres (inulin, oligofructose/FOS)
Scientifically proven, natural, plant-based prebiotics

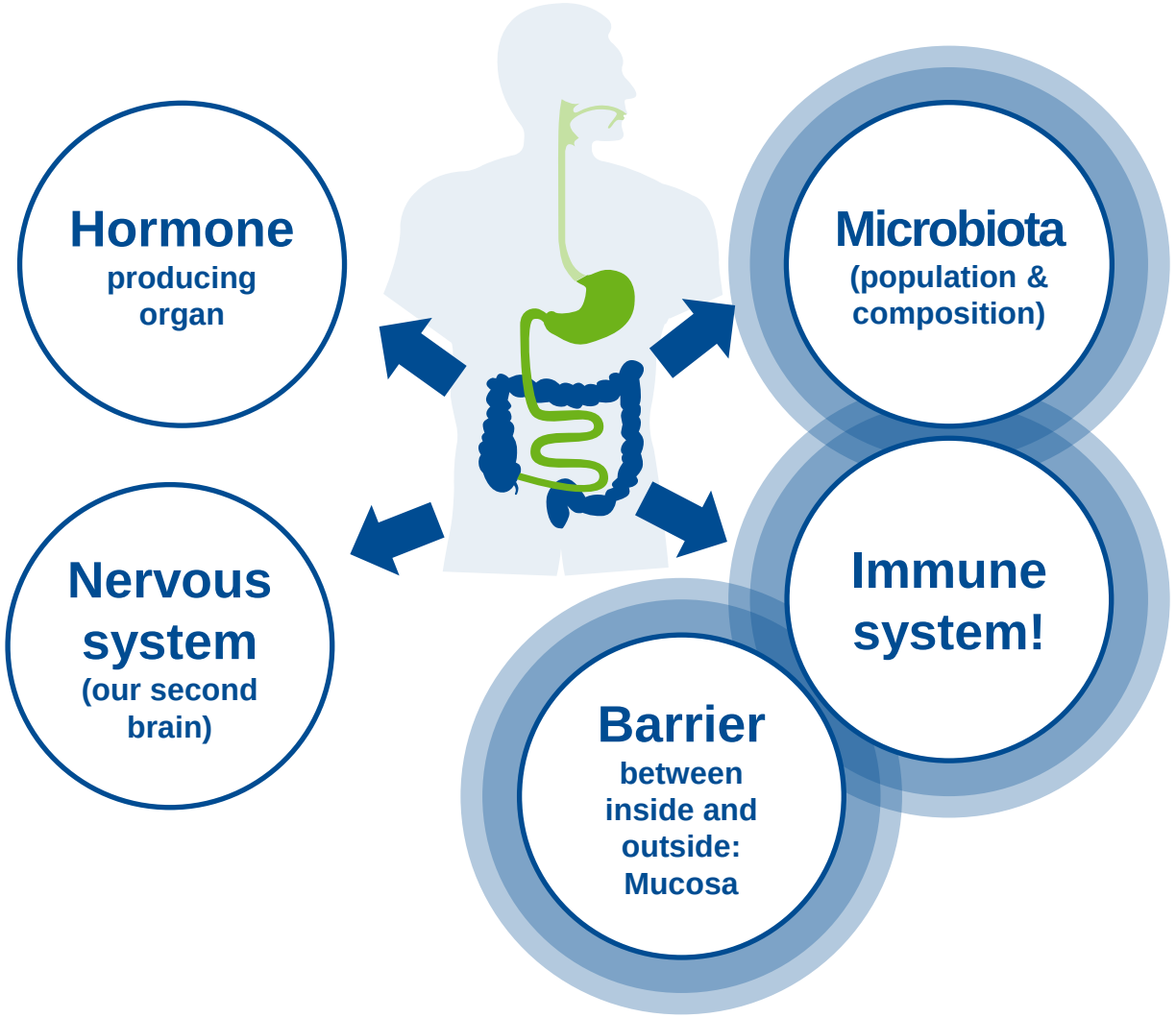


Professor Bob Rastall
University of Reading, UK
Prof Rastall presented on “Prebiotics: defined, explained and evaluated” on 21st Sep 2019 at the 11th Asia Pacific Conference on Clinical Nutrition (APCCN) and 14th China Nutrition Science Congress (CNSC) in Nanjing, China

Reported prebiotic carbohydrates

The gut microbiota is influencing everything

Beneficial shift in gut microbiota with prebiotic chicory root fibres



- Prebiotics selectively promote the good bacteria to grow and support the inner defence system and a balanced gut microbiota
- **Chicory root fibres are clinically proven prebiotics**
  - Strong body of evidence showing a selective increase in Bifidobacteria: Over 40 studies in adults; over 15 studies in infants and children

Supported by science

Ways in which Orafti® prebiotics can help support the immune system

- 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

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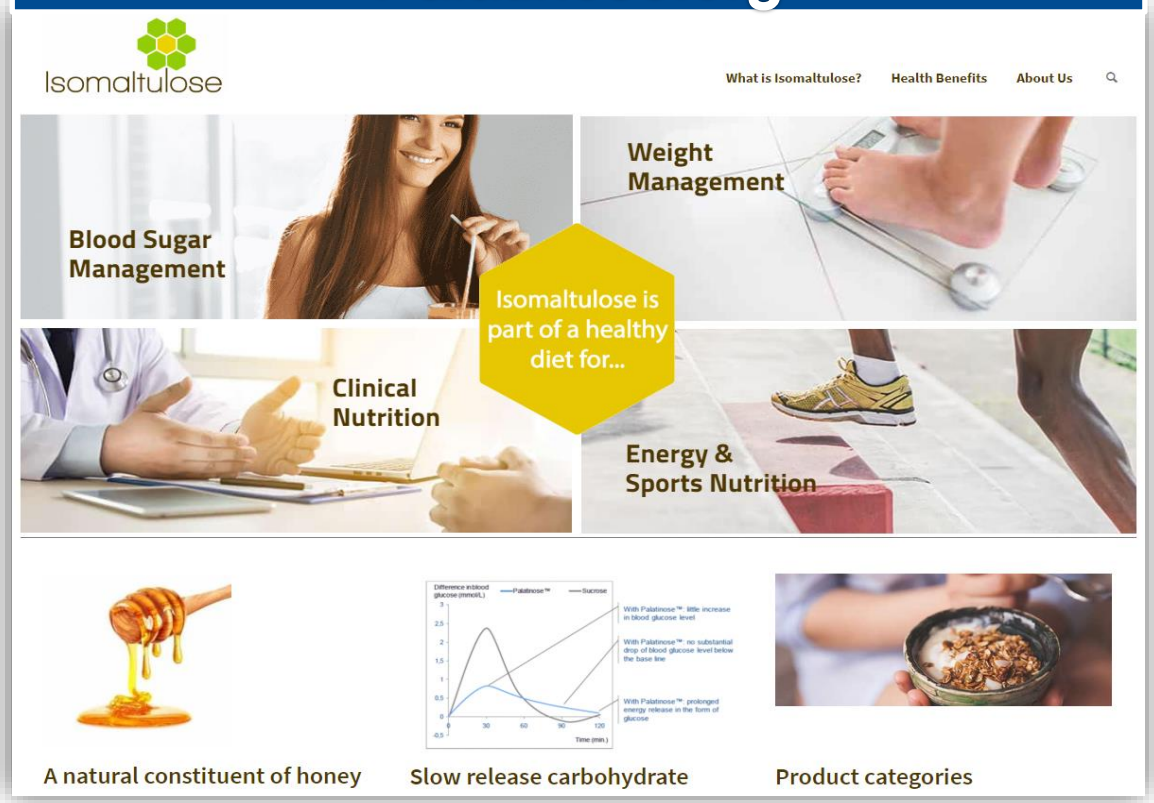
Dietary fibre and Isomaltulose websites developed for healthcare professionals

www.dietaryfiber.org

www.isomaltulose.org or Palatinose.org



www.dietaryfiber.org

www.isomaltulose.org

Palatinose.org

Thank you!

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