Nutrition Centre

By TATE & LYLE

Type 2 Diabetes:

A Growing Global Health Challenge

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Type 2 diabetes (T2D) is the most common form of diabetes, accounting for over 90% of cases worldwide(1).

Once considered a disease primarily affecting adults in wealthy countries, it has now become a global health issue, impacting people in every country, including both urban and rural areas.

The most significant increases have been seen in low-income and middle-income countries (2). Despite being largely preventable, T2D accounts for the vast majority of diabetes cases, highlighting the urgent need for preventive measures and lifestyle changes to reduce its prevalence:

Type 2 diabetes affects every aspect of life-physically, socially, and economically- impacting individuals, families, and entire communities.

Global diabetes-related health costs have surged from $232 billion in 2007 to $966 billion in 2021, a 316% increase in just 15 years. In 2024, the total global diabetes-related health expenditure exceeded $1 trillion for the first time (1).

Beyond direct medical expenses, T2D also leads to lost productivity, reduced quality of life, and complications that place additional burdens on families and economies worldwide (3,4).

At a glance:

- In 2024, an estimated **589 million** adults (aged 20–79) were living with Type 1 or Type 2 diabetes.

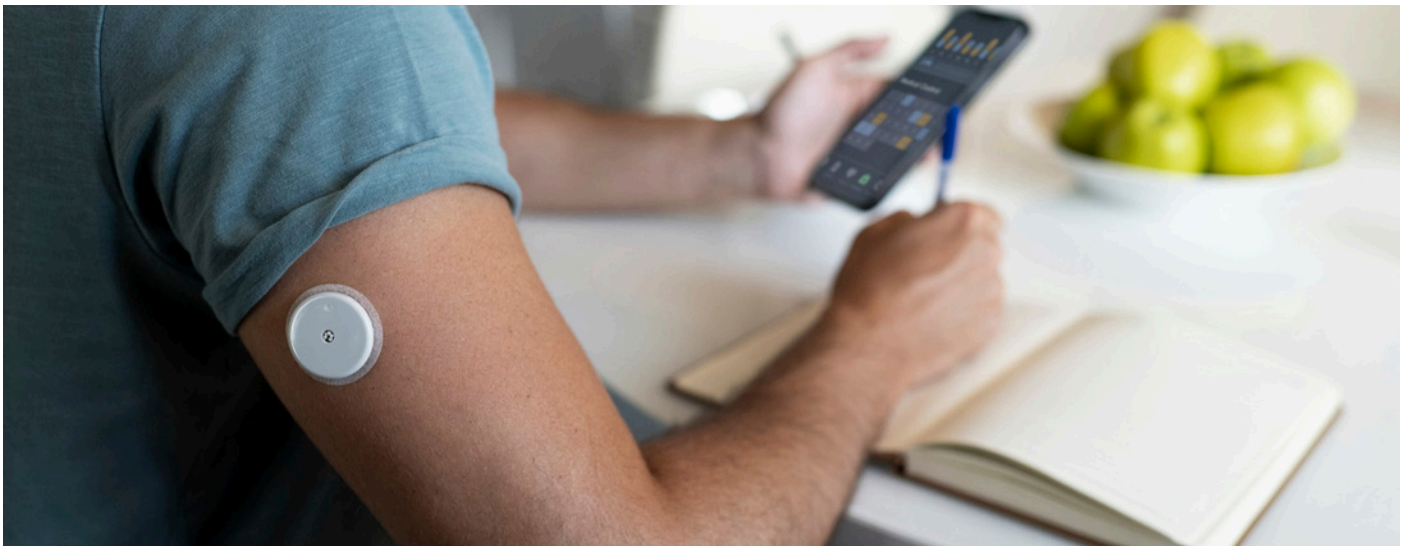
  This is equivalent to **11.1%** of all adults in this age group (1).

- By 2050, this number is projected to rise to **853 million. This is 1 in 8 adults** (1).

- People with T2D have **60% higher risk** of developing any form of cardiovascular disease (1).

The highest diabetes-related healthcare costs (USD) are in (1):

- United States: **$404.5 billion**
- China: **$168.9 billion**
- Brazil: **$45.1 billion**
- Germany: **$40.4 billion**
- United Kingdom: **$23.6 billion**



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Understanding Type 2 Diabetes[5,6]

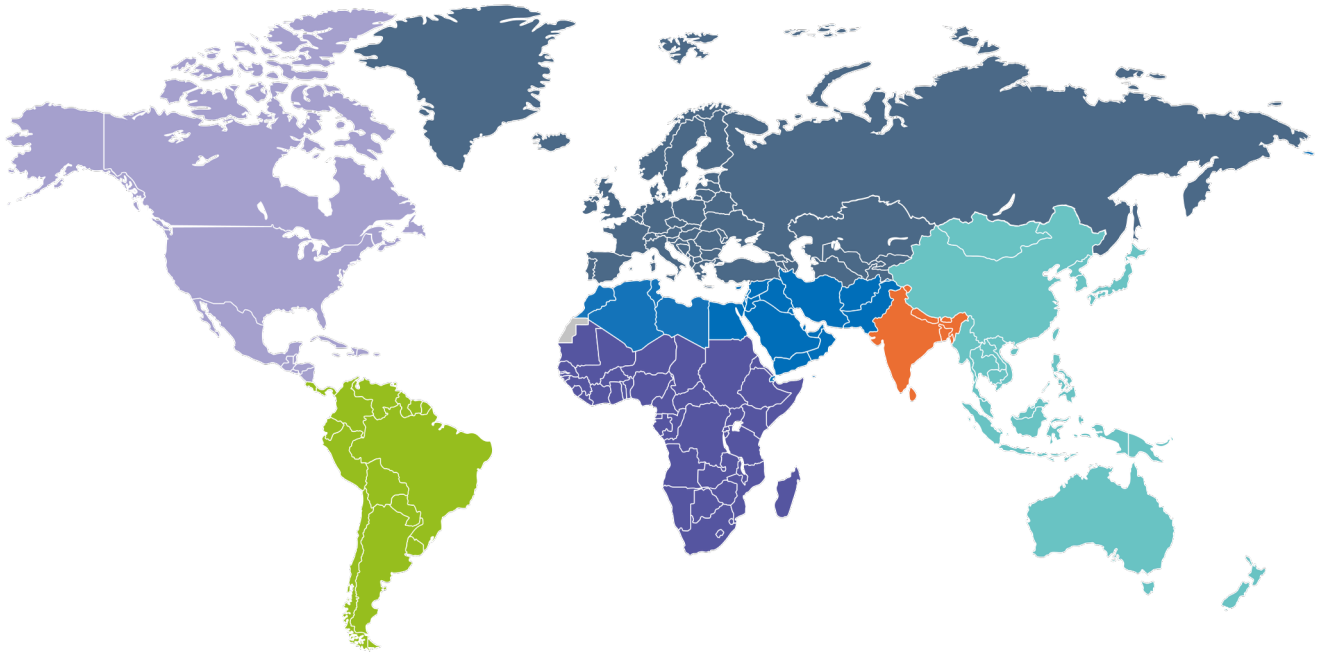
Type 2 diabetes is the most common form of diabetes and is characterised by high blood glucose, called hyperglycaemia.

- When you eat, some of the food is broken down into glucose (a monosaccharide), which enters the bloodstream. Glucose is used by the body as energy.
- Insulin, a hormone made by the pancreas, helps move glucose from the bloodstream into the cells to be used for energy or stored for later use.
- In T2D, the body doesn't respond properly to insulin – this is called insulin resistance. Over time, the pancreas may also make less insulin.
- As a result, glucose builds up in the bloodstream instead of moving into the cells, leading to hyperglycemia (high blood glucose levels).

Unlike T2D, type 1 diabetes (T1D) is an autoimmune condition in which the body produces little or no insulin due to the immune system attacking insulin-producing cells in the pancreas (1).

Global Prevalence of Type 1 and Type 2 Diabetes (1)

Per IDF region, 2024-2050 (aged 20 to 79 years)



World	Europe	North America & Caribbean (NAC)	South-East Asia (SEA)
2050 852.5 Million 2024 588.7 Million ∧45% increase	2050 72.4 Million 2024 65.6 Million ∧10% increase	2050 68.1 Million 2024 56.2 Million ∧21% increase	2050 184.5 Million 2024 106.9 Million ∧73% increase

Africa (AFR)	Middle-East & North Africa (MENA)	South & Central America (SACA)	Western Pacific (WP)
2050 59.5 Million 2024 24.6 Million ∧142% increase	2050 162.6 Million 2024 84.7 Million ∧92% increase	2050 51.5 Million 2024 35.4 Million ∧45% increase	2050 253.8 Million 2024 215.4 Million ∧18% increase

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Risk Factors and Prevention of Type 2 Diabetes and Prediabetes

Type 1 Diabetes[1]

Type 1 diabetes is one of the most common chronic conditions in children. While the exact cause is unknown, genetics may play a role in its development. This type of diabetes can occur at any age but is most commonly diagnosed in children and young adults.

Unlike T2D, T1D cannot be prevented. People with T1D need daily insulin injections to keep their blood glucose level within an appropriate range. Insulin is essential for their well-being and overall health (1).

Type 2 Diabetes and Risk Factors[7]

Type 2 diabetes is strongly linked to excess weight and obesity, particularly fat around the abdomen.

In 2022, global estimates showed:

- 2.5 billion adults were overweight (7)
- 890 million adults were obese (7)
- More than 390 million children and adolescents aged 5–19) were overweight or obese (7)

Other risk factors for T2D include:

- Lack of physical activity (8)
- Age (more common in people over 40) (8)
- Ethnicity (higher risk for Black African, African Caribbean, and South Asian populations) (9)
- Family history of diabetes, heart disease, or stroke (9)

The prevalence of T2D has increased notably in adults under 40 and has also become a concern in children and young people due to the increasing prevalence of obesity in childhood and adolescence (1).

Type What About Pre-Diabetes?

People with pre-diabetes have higher blood sugar levels than normal, increasing their risk of developing T2D in the future. However, lifestyle changes such as healthy eating and regular exercise can help delay or prevent the onset of T2D (10,11).

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Different types of diabetes[1]

Category	Type 1 Diabetes	Type 2 Diabetes	Prediabetes
Definition	An autoimmune, life-long condition where the pancreas cannot produce any or enough of the hormone insulin, leading to increased levels of blood glucose (sugar).	A chronic condition where the body becomes resistant to insulin or doesn't produce enough, leading to increased levels of blood glucose (sugar).	A condition where blood sugar levels are higher than normal but not high enough to be classified as diabetes. It is a warning stage for T2D.
Risk Factors	Family history, genetics and environmental triggers (e.g., viral infections).	Obesity; overweight, poor diet, physical inactivity, increased age, and a family history.	Obesity; overweight, poor diet, physical inactivity, increased age, and a family history.
Prevention	Cannot be prevented as it is an autoimmune disease.	Weight loss, diet high in fibre, increased physical activity.	Weight loss, diet high in fibre, increased physical activity.
Treatment	Prescribed insulin treatment.	Weight loss, increased physical activity, manage blood glucose response.	Weight loss, increased physical activity, manage blood glucose response.
Prevalence	About 5–10% of all diabetes cases worldwide.	90–95% of diabetes cases globally.	Affects a large population; an estimated 1 in 3 adults has prediabetes, many unaware.
Category	Type 1 is an autoimmune disease, meaning the immune system destroys insulin-producing cells.	Type 2 is primarily due to the inability of the body to respond to insulin and lifestyle factors.	Prediabetes is a warning stage that can be reversed with lifestyle changes before developing into T2D.

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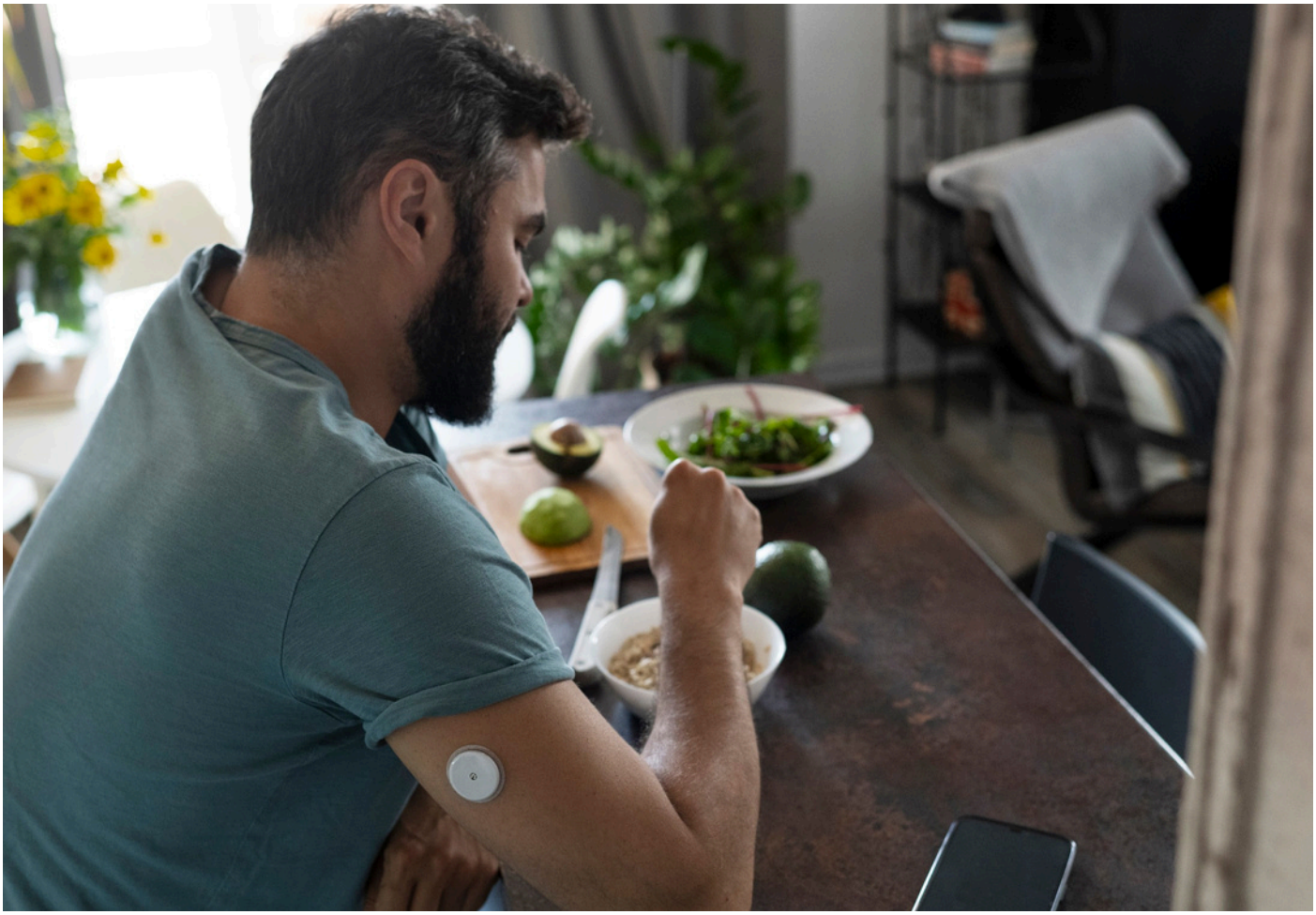

Dietary Management in Type 2 Diabetes

The number of people being diagnosed with T2D is growing at a shocking rate. This is a public health crisis; however, to a large degree, T2D is reversible.

Good evidence from randomised controlled trials shows that behavioural and lifestyle interventions focused on weight loss, adopting a healthy diet, and increasing physical activity can prevent or delay the onset of T2D (7,12,13).

Recommendations from the American Diabetes Association are that adults with diabetes should consume high fibre foods (at least 14g fiber per 1,000 kcal) (14).

Current recommendations from the European Association for the Study of Diabetes are that adults with diabetes should consume at least 35g dietary fiber per day (or 16.7g per 1,000 kcal) (15).

These two values are aligned and higher than the current World Health Organization (WHO) recommendations for the general population of at least 25g dietary fiber per day [16], although all three recommendations recognise a minimum intake level, with greater benefits observed with higher intakes (17).

While a diet high in calories from any source contributes to weight gain, sugar, and sugar-sweetened beverage consumption have been of concern due to their high intake in many parts of the world and their association with weight gain (18).

In light of this, the WHO recommends that adults and children reduce their consumption of sugar to less than 10% of total energy intake and suggests a further reduction to below 5% for additional health benefits (19).

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Factors That Affect the Blood Glucose Response

Managing blood glucose levels is essential for preventing and addressing diabetes, including prediabetes.

One effective strategy is consuming the right foods to regulate glycaemic response. Research by the International Life Sciences Institute (ILSI) Europe confirms that dietary components play a role in modulating blood glucose levels (20).

The type and amount of carbohydrates in the diet strongly influence post-meal blood glucose levels (22). Foods rich in refined or easily digestible carbohydrates, such as white bread, short-grain white rice, and cooked potatoes, can cause a rapid increase in blood glucose levels.

In contrast, dietary components that slow digestion and absorption of carbohydrates help reduce glycaemic response (20,22).

Soluble fibre, particularly viscous fibre, plays a crucial role in managing postprandial blood glucose and insulin levels. These fibres form a gel-like consistency in the stomach by absorbing water, which slows gastric emptying and glucose absorption in the intestines.

Foods rich in soluble fibre, such as oats, fruits, legumes, and specific dietary fibres like beta-glucan, pectin, psyllium, polydextrose, and soluble corn fibre, have been shown to lower post-meal blood glucose levels in both healthy individuals and those with diabetes (23,24).

The association between increased dietary fibre intake and a reduced risk of T2D is well documented. Systematic reviews and meta-analyses conducted by the WHO have found that higher fibre consumption is linked to lower body weight and a reduced risk of chronic diseases, including type 2 diabetes (25). This study was commissioned by the WHO and shaped the current fibre recommendations.

What is the glycaemic response?

The glycaemic response refers to the effect a food or meal has on blood glucose levels after it is consumed (21). This response is mainly influenced by carbohydrates, so it's important to manage both the amount and type of carbohydrates eaten.

While it is normal for blood glucose levels to rise after eating and then return to fasting levels within a short time, maintaining a balanced glycaemic response is a key strategy for reducing the risk of T2D and other chronic diseases (21).

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Reformulating Foods for Better Health

Increasing fibre intake through food reformulation can significantly benefit public health.

A peer-reviewed modelling study reported that higher fibre consumption was associated with a 6% reduction in body weight among the UK population and a decreased risk of type 2 diabetes and cardiovascular disease for 72% of individuals (26).

Similarly, a modeling study in China suggested that increasing fiber in food products could reduce the risk of T2D by 1.4%. With a population of approximately 1.4 billion, this implies that dietary fiber fortification could potentially reduce the risk of T2D in over one million people (27).

These findings highlight how reformulating common foods to include more fibre can play a crucial role in improving long-term health outcomes at a population level.

Low/No calorie sweeteners

Choosing non-nutritive sweeteners can also be helpful in moderating carbohydrate intake, which is important for blood glucose management. In addition, studies have shown that replacing free sugars with low and no-calorie sweetener (LNCS) options can reduce energy intake, therefore supporting healthy blood glucose levels (28, 29).

Because LNCS do not raise blood glucose or insulin levels (30-32), diabetes-related organisations globally, including the American Diabetes Association (ADA), the Diabetes and Nutrition Study Group of the European Association for the Study of Diabetes (EASD) (15), Diabetes UK (33,34), and the Latin-American Association of Diabetes (Asociación Latinoamericana de Diabetes – ALAD) (35) recognise that LNCS, can be safely used to replace dietary sugars and be a useful tool in the nutritional management of diabetes.

Global Consumer Insights on Health and Diabetes Awareness

Consumers around the world are becoming more aware of how lifestyle choices affect metabolic health and are taking steps to reduce their risk of conditions like T2D.

In Europe

60%

of consumers believe that eating sugary foods leads to blood sugar spikes, driving demand for products that support blood glucose management (36)

In China

65%

view regular exercise as a key component of a healthy lifestyle (37)

In Brazil

50%

prioritise healthy eating as a way to prevent illness (38)

In the US

1 in 5 undiagnosed

Despite this growing awareness, data from the US Centers for Disease Control and Prevention show that 1 in 3 Americans has prediabetes, while 1 in 5 people with diabetes remain undiagnosed (39)

This highlights the increasing global need for healthier food choices, active lifestyles, and improved metabolic health management.

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Tate & Lyle's ingredients as part of the solution for addressing the Diabetes Epidemic

At Tate & Lyle, we work closely with food and beverage manufacturers to develop innovative, great-tasting products with improved nutritional profiles.

With strong regional expertise in consumer insights, product applications, and regulatory frameworks, we help brands meet growing consumer demand for healthier choices- while supporting better health outcomes.

For people with diabetes and those at risk, maintaining a healthy weight and moderating carbohydrate intake are essential dietary strategies.

Reducing excess calorie intake is a critical step toward these goals.

We're proud to report that between March 2020 and March 2025, our portfolio of fibres and sweeteners has helped remove over 40 trillion calories from global diets*.

This reduction spans key categories like beverages, baked goods, confectionery, and ice cream-making it easier for consumers to enjoy the foods they love, with fewer calories and less sugar.

Tate & Lyle Ingredients

Tate & Lyle offers a portfolio of ingredients that help food and beverage manufacturers reduce sugar, calories and fat as well as add fibre and protein, helping to offer consumers healthier choices.

Our fibres and LNCS are valuable tools in addressing this the global health challenge of T2D. By working together, we can create a future where delicious, nutritious food options promote the well-being of consumers worldwide.

Tate & Lyle Ingredient Range - Fibres >

*March 2020- March 2025

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Promitor®

PROMITOR® Soluble Fiber

PROMITOR® Soluble Fibre elicits a low glycaemic response, making it a suitable ingredient for products designed for individuals with diabetes or those aimed at reducing glycaemic load.

Human clinical studies have evaluated the glycaemic effects of soluble corn fibre. Kendall et al. (40) showed that in healthy subjects, PROMITOR® Soluble Fiber (soluble corn fibre) in a lemonade significantly lowered postprandial glucose and insulin responses compared to a glucose-containing lemonade control.

Tan et al. (41) also observed a significant reduction in postprandial blood glucose and insulin levels when 50% of the total carbohydrate in 50g carbohydrate test rice meals and drinks were replaced with PROMITOR® Soluble Fibre in 22 healthy men compared to glucose and maltodextrin comparisons.

In 2014, the European Food Safety Authority (EFSA) concluded that a cause and effect relationship has been established between the consumption of foods/beverages containing non-digestible carbohydrates instead of sugar and a reduction of post-prandial glycaemic responses as compared to sugar-containing foods/beverages (42).

For a product to bear this claim, sugar should be replaced in foods or drinks by non-digestible carbohydrates so that foods or drinks contain reduced amounts of sugars by at least 30% compared to a similar product.

Additionally, the Food and Drug Administration (FDA) allows structure-function claims for effects derived from nutritive value, such as the effect of dietary fibre on blood glucose or describes the role of a nutrient or dietary ingredient intended to affect the normal structure or function of the human body* (43).

This authorised health claim can be supported by PROMITOR®.

*The applicability of label claims, health claims and the regulatory and intellectual property status of our ingredients varies by jurisdiction. Independent advice should be sought regarding all legal and regulatory aspects of our ingredients and their usage in your own products to determine suitability for their particular purposes, claims, freedom to operate, labelling or specific applications in any particular jurisdiction. This product information is published for your consideration and independent verification. Tate & Lyle accepts no liability for its accuracy or completeness.

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Sta-Lite® Polydextrose

In 2011, based on available data, the European Food Safety Authority (EFSA) concluded that a cause-and-effect relationship was established between the consumption of foods/drinks containing polydextrose instead of sugar and a reduction in postprandial (postmeal) blood glucose responses (without disproportionally increasing postprandial insulinemic responses) as compared to sugar-containing foods/drinks (44).

The consumption of polydextrose incorporated into foods or beverages has demonstrated a lowering of the glycaemic response.

In fact, clinical studies have reported significantly lower blood glucose and insulin responses with polydextrose consumption.

For example, Konings et al (45) observed a lower postprandial (post-meal) peak glucose and inulin responses when 30% of available carbohydrates were replaced with 57g Sta-Lite® Polydextrose split between two meals compared to a similar full-calorie diet in overweight men and women.

Euoligo® FOS

Studies show that adding fructo-oligosaccharide (FOS) to the diet can support a favourable glycaemic response. Two studies conducted in healthy adults found that replacing sucrose with FOS in dairy desserts significantly reduced post-meal blood glucose and insulin levels compared to regular desserts (46,47).

Lecerf et al. (46) showed that dairy desserts and pound cakes containing short-chain fructo-oligosaccharides (scFOS), replacing 30% of the sugar content, led to lower postprandial glucose and insulin responses.

Similarly, Respondek et al. (47) observed that dairy desserts containing maltitol and scFOS resulted in reduced postprandial glycaemic and insulinaemic responses in healthy adults when compared to traditional sugar-sweetened desserts.

The EFSA-authorised claim on the reduction of post-prandial glycaemic responses through the replacement of sugars with non-digestible carbohydrates also applies to EUOLIGO® FOS when used under the same conditions (42).

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Pectin/GENU®

GENU® Pectin is upcycled from sustainably sourced citrus peels, a by-product of the juice industry and addresses key mega trends such as sugar reduction, fat replacement (with SLENDID® Specialty Pectin) and fibre fortification.

A recent systematic review highlights the beneficial effects of pectin in supporting blood glucose management, suggesting that pectin may help reduce the rise in blood glucose levels after a meal (48).

These findings are consistent with EFSA's opinion, which concluded that a cause-and-effect relationship was established between the consumption of pectins and a reduction of post-prandial glycaemic responses, with at least 10g of pectin per meal in adults (49**).

This authorised health claim can be supported by Pectin/GENU® Pectin.

**Warning of choking to be given for individuals with swallowing difficulties or when ingesting with inadequate fluid intake – advice on taking with plenty of water to ensure substance reaches stomach (49).

Low/No Calorie Sweeteners (LNCS) >

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Allulose

DOLCIA PRIMA® Allulose

Allulose is naturally found in low concentrations in certain fruits and foods, including figs, raisins, molasses and maple syrup. Allulose is absorbed but not fully metabolised, thus it has negligible calories (50).

Allulose consumed alone does not raise blood glucose or insulin levels in healthy individuals with normal glycaemic levels, or in individuals with T2D (unpublished internal reports). Allulose, when consumed with glycaemic carbohydrates, modestly reduces postprandial glycaemic response in individuals with T2D, with prediabetes and with normal glycemia (51-53).

While these results are interesting, further research is needed to determine if there are long-term benefits of allulose in the diet.

DOLCIA PRIMA® Allulose from Tate & Lyle is 70 percent as sweet as sugar and can replace sucrose or high-fructose corn syrup. It has 0.2 kcal/g* and blends well with other sweeteners to reduce calories while providing a great sweet taste.

*Caloric labeling varies based on local and country regulations.

Monkfruit

PUREFRUIT™ Monk Fruit Extract

Monk fruit extract (also called luo han guo or Siraitia grovesnorii) is a natural, zero-calorie sweetener obtained from monk fruit grown in the subtropical climate of Asia. In a study comparing the effects of consuming monk fruit in a beverage, it was found that the beverage with monk fruit did not raise daily energy intake, blood glucose nor insulin (54).

PUREFRUIT™ Monk Fruit Extract from Tate & Lyle has 100 to 200 times the sweetness of sugar, allowing for sugar reduction up to 100 percent in certain foods and beverages.

This ingredient is appropriate for a wide range of applications in foods and beverages.

Stev i a

TASTEVA® Stevia Sweetener

Stevia sweeteners are extracted from the stevia plant, have zero calories and are considered to have 200 to 300 times the sweetness of sucrose.

A few clinical studies have evaluated the postprandial glycaemic effect of stevia products in healthy individuals and people with T2D, with some indicating no significant change (54-57) and others indicating a significant reduction (30, 58) compared to a control (placebo, sucrose, water, mixed meal). Most studies have not observed a significant effect on fasting blood glucose levels, but a meta-analysis of available studies reported a very small, clinically insignificant, reduction in fasting blood glucose when stevia is consumed (59).

Tate & Lyle offers a complete range of innovative stevia sweeteners produced from stevia leaf extracts. Sweetness of stevia sweeteners ranges from about 200 to 300 times that of sugar.

Finally, rooted in a joint commitment to accelerate sugar reduction, Tate & Lyle has partnered with Manus, a leading bio alternatives scale-up platform, to expand access to sugar reduction solutions. This large-scale commercialisation of an all-Americas-sourced, manufactured, and bio converted stevia Reb M enhances Tate & Lyle's portfolio to better meet the needs of customers and consumers globally.

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