



# THE CASE FOR A LITTLE SWEETNESS

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The Role of  
Low/Non-Calorie  
Sweeteners on Health







## About Food Industry Asia

Food Industry Asia (FIA) is a non-profit organisation that was formed in 2010 to enable major food manufacturers to speak with one voice on complex issues such as health & nutrition, food safety and the harmonisation of standards.

From its base in Singapore, FIA seeks to enhance the industry's role as a trusted partner and collaborator in the development of science-based policy throughout Asia. To do so means acting as a knowledge hub for Asia's national industry associations and affiliated groups, to support with their engagement of public bodies and other stakeholders across the region.

## Our Vision

To be a trusted partner for businesses and governments — building a vibrant food & beverage (F&B) industry for a healthy and prosperous Asia.

## Our Mission

To represent the food and beverage industry in Asia — promoting a climate for sustainable growth and serving as a regional knowledge hub for science-based advocacy.



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This series will explore the role of sweeteners and their impact on health. The first paper examines Low/Non-Calorie Sweeteners (LNCS) and addresses some of the many myths surrounding them. The LNCS covered in this paper include acesulfame potassium (acesulfame-K); aspartame; Monk fruit, saccharin; stevia sweeteners; sucralose; sugar alcohols (e.g. mannitol, sorbitol, thaumatin and xylitol). The following papers will examine the role of various sweeteners on diet and health.



## The cost of diabetes in China:

China has taken the global lead on diabetes with nearly 10 per cent (approximately 110 million people) of its adult population diagnosed with diabetes, and the number is projected to increase to 150 million by 2040.<sup>8</sup> While this may not be surprising given its large population, it costs about USD 170 billion to treat, manage diabetes and its complications, such as limb amputations.<sup>9</sup>



## LNCS at a Glance



Provide sweetness with little or no calories;



Commonly used in some of our favourite foods and beverages to provide sweetness;



Their safety has been thoroughly tested and confirmed by regulatory authorities around the world

<sup>1</sup> Halo-halo is a popular dessert in the Philippines with mixtures of shaved ice and evaporated milk to which are added various ingredients, including boiled sweet beans, coconut, sago, gulaman, tubers and fruits.

<sup>2</sup> Kueh lapis is an Indonesian pastry, or a traditional snack of colourful layered soft rice flour pudding.

<sup>3</sup> Diabetes is a chronic, metabolic disease characterised by elevated levels of blood glucose (or blood sugar), which leads over time to serious damage to the heart, blood vessels, eyes, kidneys, and nerves. Type 2 diabetes, occurs when the body becomes resistant to the normal effects of insulin and/or gradually loses the capacity to produce enough insulin in the pancreas.

<sup>4</sup> Hypertension or high blood pressure (HBP) is defined as a blood pressure consistently exceeding 140/90mmHg when resting. Uncontrolled high blood pressure leads to serious complications like heart attack, stroke, blindness and chronic kidney failure.

<sup>5</sup> Hypertriglyceridemia is a condition in which triglyceride levels are elevated. It is often caused or exacerbated by uncontrolled diabetes mellitus, obesity, and sedentary habits.

<sup>6</sup> Heart disease describes a range of conditions that affect the heart. Diseases under the heart disease umbrella include blood vessel diseases, such as coronary artery disease and heart rhythm problems (arrhythmias).

# INTRODUCTION

Many people across the world have a fondness for eating sweet foods. Evolutionary biologist Jason Cryan noted that the explanation for having a sweet tooth revolved around the idea of having a physiological association for sweet-tasting, high-energy food, as this would have helped our earliest ancestors survive.<sup>1</sup> Over time, this desire for sweet foods has progressively been associated with people rewarding themselves for an achievement, or celebrating a happy occasion.

Asia is no different. Sunday family meals in the Philippines would lose much of their magic without *Halo-halo*<sup>1</sup> as a final refreshment. Singaporeans could not begin to imagine celebrating Chinese New Year without indulging in sweet and buttery pineapple tarts. Similarly, the vast majority of Indonesians celebrate weddings or the breaking of fast during Ramadan by eating *kueh lapis*.<sup>2</sup>

Yet, it is easy to have too much of a good, sweet thing. Not only are many people fond of the taste of sugar, combine this with the fact that it is easily available and affordable, it is no wonder an increasing number of people are consuming more sugar on a daily basis.

This has led to public concerns that the increase in obesity rates and its associated diseases might be due to the over-consumption of sugar.

However, sugar should not be singled out as the only cause of the rising epidemic of obesity and non-communicable diseases (NCDs) such as type 2 diabetes,<sup>3</sup> hypertension,<sup>4</sup> hypertriglyceridemia,<sup>5</sup> and heart diseases.<sup>6</sup> While increased sugar consumption is one of the factors that should be considered, it is the combination of over-consumption of food, physical inactivity and other lifestyle factors that contributes to the increase in NCDs.<sup>2</sup>

Studies have shown that Asians – even those of a lower body mass index (BMI) – are at a higher risk of developing type 2 diabetes and cardiovascular diseases, when compared with people of European ancestry.<sup>3 4 5</sup>

This means that even though some Asian populations currently have a lower prevalence of overweight and obese individuals than populations in the West, they have a disproportionately high percentage of people with diabetes.<sup>5</sup> In fact, 60 per cent of the world's diabetic population is Asian.<sup>6</sup>

The impact of NCDs within a population extends beyond ill-health and mortality with large financial consequences for both healthcare spending and national income.<sup>10</sup> Health professionals from the academia, F&B and medical industries, public health and government sectors have been searching for ways to help improve health and nutrition in the region, without eliminating the excitement of enjoying sweet foods and drinks.

The growing demand for ingredients that impart sweetness with significantly less or no calories has resulted in the innovation of LNCS.

**LNCS are a class of food additives that provides sweetness in foods and beverages by contributing to a minimal or negligible amount of calories<sup>11</sup> without compromising on the palatability of healthier food alternatives.**

While LNCS can support weight reduction and maintenance,<sup>12 13 14 15</sup> studies have also shown that LNCS do not affect blood glucose and insulin levels,<sup>13 16 17 18</sup> which enables the development of sweet-tasting foods and drinks for individuals who must carefully monitor carbohydrate intake, such as those with diabetes.<sup>19</sup>

Worldwide, with as many as 422 million people suffering from diabetes<sup>20</sup> and 1.9 billion overweight,<sup>21</sup> LNCS could provide a good alternative to sugar. However, the reputation of LNCS has constantly been challenged and become the subject of intense public debate. Among other claims, LNCS have been accused of causing weight gain and associated with some cancers, despite current scientific findings suggesting otherwise.

**This white paper is set out to serve as an educational tool to the food and nutrition community by providing science-based information on LNCS and addressing some of the common myths.**

Did you know that 1 pineapple tart (20g) has 93 calories, of which six grams are sugars?<sup>27</sup>



Shannon Tan  
28, Lawyer,  
Singapore

"Sweetness has always been a part of my life, but I'm trying to live a healthier lifestyle so am more conscious of the amount of sugar I'm consuming. But old habits die hard. I like drinking sweetened drinks with my meals, rather than just water, and I especially enjoy cracking open a can of fizzy drink when I'm having a steamboat dinner with family and friends. At work, snacking is a guilty pleasure, from chocolates to sweets and cakes. I don't really know much about sugar alternatives and sweeteners but they seem like a good option, provided they are safe."



Art Navarro  
34, Marketing,  
Philippines








"I grew up in a family that loves sweets. We drank a lot of soda and I even used to add sugar to my Kool Aid. Fun with the family usually included lots of sugar, especially when we baked cakes and ate the batter or cookie dough right out of the mixer. We've had to cut down on sugar for health reasons but a new generation of nieces and nephews still love eating sugar."



# UNDERSTANDING LNCS

## LNCS – The Basics

LNCS are used in a variety of food products such as:

-  soft drinks
-  baked goods
-  chocolates
-  confectionery
-  frozen desserts
-  yoghurt
-  pudding

They are also widely used in healthcare, making medicines more palatable.

Though they are generally referred to as LNCS by the scientific community, they are sometimes also referred to as artificial sweeteners, non-nutritive sweeteners, low energy sweeteners, high intensity sweeteners, high-potency sweeteners and sugar substitutes.<sup>22</sup> LNCS are labelled on the packages of food, beverages and healthcare products that contain them.

**Did you know that sugar alcohols are natural sugar-substitutes and not actually alcohol?**



Sugar alcohols namely sorbitol and mannitol are manufactured from corn starch while xylitol can be made from sources such as corn cob or sugar cane bagasse (stalk residue that remains after sugar extraction).<sup>25</sup>

## Types of LNCS

LNCS can be classified into two main categories: bulk sweeteners and intense sweeteners.<sup>23</sup>

### Bulk Sweeteners

Bulk sweeteners, mainly sugar alcohols or polyols such as sorbitol, xylitol and mannitol are often used as a sugar replacer in foods while also contributing to its textural properties, particularly in confectionery such as chewing gum. While sugar provides 4 calories per gram, polyols carry about 2.4 calories and are not completely metabolised in the body. Rare sugars such as allulose, isomaltulose and tagatose can also be classified under this category.






### Intense Sweeteners

Aspartame, sucralose, saccharin and acesulfame-K are some examples of intense sweeteners, which are hundreds of times sweeter than sugar. As minimal amount is needed to achieve the desired level of sweetness, it contributes to negligible amounts of calories and passes through the body unchanged.

Similarly, fruit extracts such as Steviol Glycosides (Stevia) and Monk fruit (*Luo Han Guo*) are 200-300 times sweeter than sugar. These plant-based derivatives are used in sugar-free soft drinks, jams, flavoured milk and other dairy products, amongst other food products. While Monk fruit virtually contains no calories, it is often used alongside other ingredients that may add calories and thus, is labelled as a “light” or “reduced calorie” product.<sup>24</sup>

## The Basic Properties of LNCS

### Low-calorie sweeteners at a glance

<b>SUCRALOSE</b> 600x sweeter than sugar		1998	Splenda
<b>SACCHARIN</b> 300x sweeter than sugar		1958	Sweet 'N Low Sweet Twin Sugar Twin
<b>ACESULFAME-K</b> 200x sweeter than sugar		1988	Sunett Sweet One
<b>STEVIA SWEETENERS</b> 200x sweeter than sugar		2008	Truvia TM PureVia TM Sun Crystals
<b>ASPARTAME</b> 180x sweeter than sugar		1981	NutraSweet Equal

Source(s): Comprehensive Reviews in Food Science and Food Safety, 2006; Food and Chemical Toxicology, 2008, 2011

## Uses of LNCS in the F&B industry

### How are LNCS currently being used in the F&B industry?

A wide variety of products contain LNCS – these include soft drinks; dairy products such as yoghurt and ice cream; desserts; chewing gum; condiments such as salad dressing, mustard and sauces; and many other products such as chewable multivitamins, mouthwashes and cough syrups.

They are some of the most studied and reviewed food ingredients in the world and have passed rigorous safety assessments. Some of the most common LNCS used in foods and beverages today are aspartame, saccharin, sugar alcohols, Monk fruit and stevia sweeteners.

Some intense sweeteners like acesulfame-K have a rapid onset of sweetness while others such as thaumatin have a slow onset and lingering sweetness. Food manufacturers can combine more than one sweetener to achieve a synergistic effect in a product that helps to meet the demands of consumers.<sup>26</sup>

## How are Intense Sweeteners Made?

### From Plant Extracts

- Monk fruit, also known as *Luo Han Guo*, is a small round fruit grown in Southeast Asia. Monk fruit sweetener is created by removing the seeds and skin of the fruit, crushing the fruit, and collecting the juice.
- Stevia sweeteners are composed of extracts known as highly purified steviol glycosides, which are taken from the stevia plant leaves. The stevia plant is native to South America but today it can be found growing in many countries, including Argentina, Brazil, China, India, Paraguay, and South Korea.

### From Molecular Transformation

- Acesulfame potassium is made by transforming an organic intermediate, acetoacetic acid, and combining it with the naturally occurring mineral, potassium, to form a highly stable, crystalline sweetener.
- Sucralose is made by replacing three hydrogen-oxygen groups in the sugar molecule with three chlorine atoms, resulting in an intensely sweet, zero-calorie sweetener.



### Why does the F&B industry invest in innovation and research & development (R&D) to use LNCS?

With the consumer trend shifting towards healthier lifestyles, the F&B industry has been investing in R&D to reduce sugar in its products. However, sugar reduction is far more challenging than 'just taking the sugar out' as they contribute to other functional roles apart from influencing taste. Commonly known as 'table sugar', sugar plays several important roles in food. While providing sweetness is one of them, sugar can enable food preservation by binding water in products such as jams, jellies and cured hams, apart from contributing to the colour in baked goods and textural properties in frozen desserts and other food products.<sup>27</sup> With innovation and technological advancements in product development, the introduction of LNCS to foods have led food manufacturers to provide a wide variety of food products with varying caloric values and taste profiles.



At the 2017 International Food Technologists (IFT) Meeting & Expo, Cargill announced a next-generation sweetener called EverSweet. Made using the age-old process of fermentation, Cargill was able to extract sweetness molecules from stevia leaves – the end product offers heightened sweetness with a body and mouthfeel similar to real sugar.<sup>28</sup>

Halo Top ice cream was launched in 2012, but its consumption exploded in 2016 and 2017, when it was named as one of Times magazine's 25 best inventions of the year.<sup>29</sup>

### Which LNCS should be used for cooking?

Acesulfame potassium (acesulfame-K) can be used in baking because it is stable, retaining its sweetness at normal baking temperatures. Sucralose, which is also heat stable in the presence of water is a great calorie-saving option to use in your favourite cooking and baking recipes. With items such as sweet sauces, fruit pie fillings, cheesecakes, glazes, and beverages, complete substitution of sugar with sucralose is possible. Aspartame, however, is heat-sensitive; therefore, it is not recommended for use in baking or in cooking methods that require extended exposure to high temperatures. While there is no safety concern with doing so, the flavour, however breaks down, reducing the sweetness of the final product.

### Why is it so popular?

Vanilla Bean, Halo Top's best-selling flavour, contains only 60 calories and 6 grams of protein per half-cup serving. The same size serving of regular ice cream has around 270 calories and 4 grams of protein.

### How is this possible?

Halo Top uses both stevia and erythritol to cut back on the amount of sugar in its recipe. Halo Top has become one of the most popular products available in the frozen dessert aisle and its annual sales soared roughly 2,500% last year with its growth reflecting shopper's growing desire to shop for healthy and unique products from small brands.

## DEBUNKING MYTHS AROUND LNCS



### MYTH ONE

LNCS are not safe for consumption.



### TRUTH

Approved LNCS are safe for consumption as they are only made available to the consumer, following the rigorous safety assessments conducted by the respective food safety authorities.



### MYTH TWO

LNCS will make me fat.



### TRUTH

LNCS can aid in weight management.



### MYTH THREE

LNCS will make me crave for more foods.



### TRUTH

With fewer calories, LNCS can help satisfy the temptation for sweet snacks without increasing one's food cravings.



### MYTH FOUR

LNCS do not contribute to health benefits.



### TRUTH

When used judiciously, LNCS can aid in glucose management, weight management and dental health.



MYTH 1  
LNCS are not safe for consumption

TRUTH  
The safety of LNCS are assessed and approved by the relevant regulatory bodies, prior to their use in foods.

LNCS have a long history of safe use; this dates back to the discovery of the first sweetener, saccharin, almost 140 years ago.<sup>30</sup> Over the last century, many LNCS have been developed and used safely in a variety of foods and beverages. With LNCS being one of the most studied and reviewed food ingredients in the world, they are subject to a rigorous safety assessment and evaluation by numerous national and international regulatory bodies prior to their use in foods, and being made available to the consumer.

Globally, sweeteners have been thoroughly assessed for safety by leading authorities, such as the Joint FAO/WHO Expert Committee on Food Additives (JECFA),<sup>31</sup> the European Food Safety Authority (EFSA),<sup>32</sup> the US Food and Drug Administration (USFDA),<sup>33</sup> Food Standards Australia and New Zealand (FSANZ),<sup>34</sup> and Health Canada.<sup>35</sup> Within Asia, national regulatory bodies such as the Singapore Agri-Food & Veterinary Authority (AVA),<sup>36</sup> China National Centre for Food Safety Risk Assessment (CFSA),<sup>37</sup> Hong Kong Centre for Food Safety (CFS),<sup>38</sup> Korea National Institute of Food and Drug Safety Evaluation (NIFDS),<sup>39</sup> and Thailand Food and Drug Administration (TFDA)<sup>40</sup> carry out similar safety assessments to ensure that food products containing sweeteners meet the set criteria and are safe for the general population.

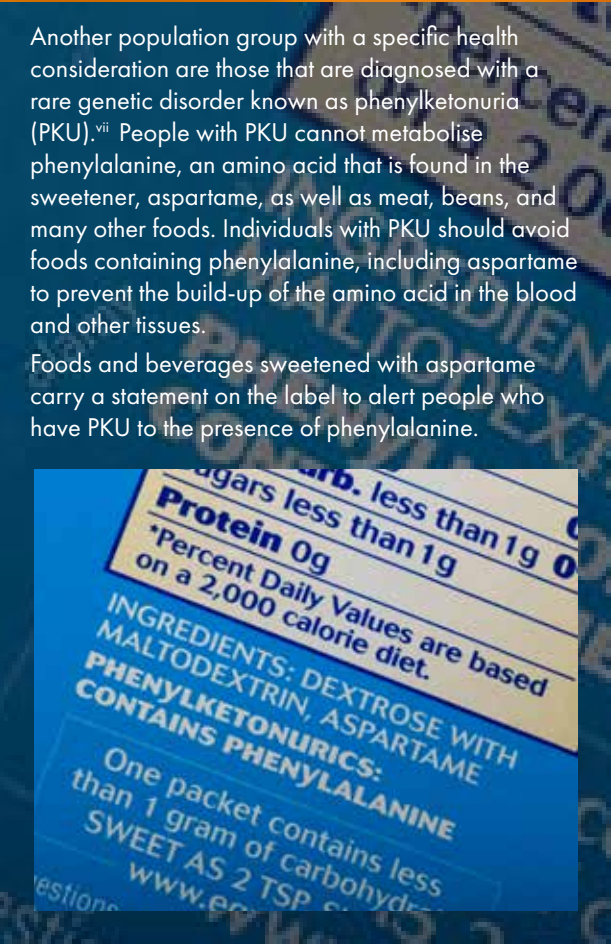
<sup>vi</sup> Phenylketonuria or PKU is a rare inherited disorder that results in the inability to break down the amino acid phenylalanine, which then builds up in the blood and brain causing brain damage

<sup>vii</sup> Defined as the destructive effect on a cell's genetic material (DNA & RNA) causing mutations

Are LNCS safe for pregnant, lactating women and children?

**Yes.** Regulatory bodies such as JECFA, USFDA and EFSA have established that LNCS are safe for all populations, including special groups such as the elderly, children, pregnant and lactating women within Acceptable Daily Intake (ADI) limits. The evidence from the safety evaluations, focused on the possible effects of LNCS on pregnant women and the foetus, indicated that there is no risk associated with its consumption.<sup>42 43 44</sup>

Although, LNCS are not approved for use in “baby foods” targeted at infants and young children up to three years of age, children above this age group can safely consume LNCS without the risk of exceeding the ADI limits.<sup>45</sup>



Are LNCS linked to cancer?

**No.** While some LNCS namely aspartame and saccharin have been associated with causing leukaemia and bladder cancer, the conclusion was drawn based on a series of animal experiments conducted specifically on rats. According to the experiments conducted on human subjects, it was evident that these sweeteners are not linked with cancer risks and do not cause any harm when the consumption levels of sweeteners are kept within the recommended ADI levels (40mg/kg body weight for aspartame and 5mg/kg body weight for saccharin) according to EFSA<sup>46</sup> and USFDA.

The misconception that similar effects will be observed in human subjects may have been a contributing factor to the negative associations of sweeteners at present; in spite of the approval from the regulatory bodies and the scientific proof that the sweeteners are not hazardous to health. Moreover, a recent genotoxicity<sup>viii</sup> (lab-based and population studies) data review on aspartame,<sup>47</sup> revealed that aspartame - a sweetener form made up of aspartic acid and phenylalanine - is non-genotoxic; showing no indication of gene mutations across a number of bacterial mutation tests, bone marrow micronucleus, chromosomal aberration and comet assays. The aforementioned review was reaffirmed by the conclusions made by EFSA.

Similarly, the International Sweetener Association (ISA) had disproved the conclusions<sup>48</sup> of a publication by Dr Morando Soffritti and team. The study, which was conducted on mice, evaluated the carcinogenic effects of sucralose.<sup>49</sup> The study however, was negated by the ISA as conclusions drawn from this publication were inconsistent and made from a single study. Moreover, the Ramazzini Institute has had a history of conducting research studies that are not reliable for safety assessments and are often criticised for its study designs and analyses, which do not always follow the guidelines for standard scientific research. Majority of the scientific research has shown that sucralose is safe for consumption. As sucralose has been evaluated by leading scientific and regulatory authorities on a global scale, it is apparent that it is a safe ingredient for use in the F&B industry.

What are Acceptable Daily Intake (ADI) Limits?

The ADI is an estimate of the amount of a food additive in food or beverages expressed on a body weight (BW) basis that can be ingested daily over a lifetime without appreciable health risk to the consumer. The ADI is expressed in milligrams of the food additive per kilogram of body weight on a daily basis.<sup>41</sup>

In other words, it illustrates the safe intake level over a lifetime without risk and if an individual occasionally exceeds the ADI limit, it is of no concern.

Sweetener	ADI Limit
Acesulfame-K (Sunett/ E950)	> 15mg/kg body weight
Aspartame (NutraSweet/ Equal/ E951)	> 40mg/kg body weight
Saccharin (Sweet N Low/ E954)	> 5mg/kg body weight
Sucralose (Splenda/ E955)	> 5mg/kg body weight
Sugar Alcohols (E420-422, E953, E965-968)	> Not specified

Source: ADI established by JECFA



**MYTH 2**  
**LNCS will make me fat****TRUTH**  
**LNCS can aid in weight management**

"In a consensus paper published by Nutrition Bulletin, a panel of five renowned experts<sup>xiii</sup> summarised the scientific evidence on the benefits of LNCS, as reviewed at the International Sweeteners Association Conference in April 2014.

Based on the available evidence, the experts concluded that low calorie sweeteners help to reduce energy when used in place of higher energy ingredients [such as sugar]."<sup>18</sup>



Experts do agree that LNCS is not a "magic bullet" for weight loss.<sup>59</sup> Instead, they should be viewed as one of many safe options that can be included in broader weight reduction or maintenance strategies. Successful weight management goes beyond calorie reduction. This includes adopting a balanced diet, eating a variety of foods in moderation along with regular physical activity to reach and maintain one's optimal weight.

While a few observational studies<sup>ix</sup> have suggested that LNCS may cause cravings and lead to weight gain,<sup>50 51 52</sup> the conclusions are often drawn from animal studies and cannot establish causation or directly applied to humans. While such findings have not changed the overall scientific consensus on LNCS aiding weight management, a 2014 meta-analysis<sup>x</sup> published in the American Journal of Clinical Nutrition also highlighted that findings from observational studies showed no association between LNCS intake and body weight or fat mass. However, data from randomised controlled trials indicated that replacing the regular-calorie versions of food and beverages with LNCS alternatives resulted in a modest weight loss.<sup>12</sup>

While some literature on LNCS is skewed towards causing weight gain as it is with the overconsumption of sugar, it has been identified that the high intensity of sweeteners affects appetite regulation, which in turn increases cravings for sweet snacks.

A study led by the University of Sydney, highlighted that the prolonged exposure to intense sweeteners led to an increased energy intake to compensate for the high sweetness intensity.<sup>53</sup> This could eventually cause greater impairments in glucose intolerance<sup>xi</sup> particularly in obese individuals, raising the risk of type 2 diabetes.<sup>54</sup>

However, there is also a pool of evidence indicating that there are no adverse health effects from consuming beverages sweetened with an intense sweetener.<sup>15 55</sup>

A study conducted by the National Weight Control Registry in the United States<sup>15 56</sup> showed that it was safe to swap Sugar-Sweetened Beverages (SSBs) with low/non-caloric beverages for those who are unable to do so without SSB consumption.<sup>57</sup>

Similarly, a comprehensive review conducted in 2016 concluded that LNCS activation of the human gut sweet taste receptors does not alter gut motility, gut hormones or appetitive responses that could cause weight gain.<sup>58</sup>

<sup>ix</sup>An observational study is an empiric investigation that attempts to estimate the effects caused by a treatment when it is not possible to perform an experiment.

<sup>x</sup>Meta-analysis is a set of techniques used "to combine the results of a number of different reports into one report to create a single, more precise estimate of an effect" (Ferrer, 1998)

<sup>xi</sup>A pre-diabetic state of hyperglycaemia that is associated with insulin resistance and risk of cardiovascular pathology

<sup>xiii</sup> The panel of scientific experts include: Prof Adam Drewnowski, Professor of Epidemiology, Director of the University of Washington Center for Obesity Research, University of Washington, USA; Prof James Hill, Professor of Pediatrics and Medicine, Executive Director, Anschutz Health and Wellness Center, University of Colorado School of Medicine, USA; Prof Anne Birgitte Raben, Department of Nutrition, Exercise and Sports, University of Copenhagen, Denmark; Prof Eeva Widstrom, Chief Dental Officer, C DO Professor at the National Institute for Health and Welfare, Finland; Prof Hely Tuorila, Chair of Sensory Food Science, University of Helsinki, Finland.





### MYTH 3 LNCS will make me crave for more food

## TRUTH

**LNCS do not increase one's appetite and can help satisfy the temptation for sweet snacks with fewer calories, without increasing one's food cravings.**

The use of LNCS is often questioned in the media suggesting that it increases appetite, which may influence people to overeat, to make up for the energy saved by substituting sugar. However, studies over the years have determined that LNCS do not increase appetite, food intake or cause weight gain.<sup>12 13 14 15 60 61</sup>

While the relationship between the consumption of LNCS and the heightened appetite for sugar or sweet products is not conclusive<sup>61</sup>, A CHOICE (Choose Healthy Options Consciously Everyday) study<sup>62</sup>, comparing beverages sweetened with LNCS and water (as a control) revealed that neither of the two beverages increased food cravings. In fact, the diet beverage drinkers ate fewer sweet foods and desserts than those who drank only water.

Taste sensitivity can change with weight loss as a result of hormonal changes, one of which that leads to the decrease in leptin<sup>xiii</sup> levels and increase in ghrelin.<sup>xiv</sup> While this can be accompanied by an increase in appetite for sweet-tasting foods, regardless of LNCS consumption, the impact from hormonal changes due to weight reduction might be incorrectly associated with the use of LNCS.<sup>63 64</sup>

<sup>xiii</sup> Leptin is a hormone that is synthesised and secreted by the fat cells. This hormone helps regulate food intake and energy expenditure by reducing appetite.

<sup>xiv</sup> Ghrelin, also known as the "hunger hormone", assists in the stimulation of appetite.

LNCS can act as an alternative for consumers to guide them with their lifestyle changes – to help with energy balance, support a healthy weight or simply provide a sweet taste without adding calories.



### MYTH 4 LNCS does not contribute to health benefits

## TRUTH

**When used judiciously, LNCS can support glucose management, weight management and dental health.**

While LNCS can provide sweetness with minimal amounts of calories, they also play a role in dental health and diabetes management.<sup>18</sup>

### Can LNCS help with Diabetes Management?

Diabetes is a metabolic disorder<sup>xv</sup> that results from the body's inability to produce or use insulin. It is important that diabetic patients maintain their blood sugar levels within healthy limits.

As LNCS do not affect blood sugar or insulin levels, they can help with the maintenance of blood sugar by providing the sweet taste without causing a spike in blood glucose levels, offering people with diabetes broader food choices and a greater flexibility with their health and dietary goals.<sup>65 66 67</sup>

### Can LNCS improve Dental Health?

Tooth decay is the outcome of the demineralisation of tooth enamel by acid in the mouth, produced by oral bacteria that metabolises, or ferments carbohydrates, such as sugar, that we ingest. It has become the most prevalent condition among common diseases, affecting almost half of the world population (44 per cent) in 2010.<sup>68</sup>

Ordinarily, we minimise our risks of common tooth decay by having a good oral hygiene and eating a healthy diet. But these practices may not entirely remove risk, and frequent consumption of foods or beverages that are high in sugar, particularly without good dental hygiene, may present an increased risk for tooth decay.<sup>69</sup>

As LNCS are not fermentable by oral bacteria, they cannot contribute to, or promote dental decay. Along with good dental hygiene, dentists may recommend LNCS as a way help prevent tooth decay<sup>70</sup> if consumed instead of sugars as part of a balanced diet to decrease tooth demineralisation.<sup>19</sup>

Five reasons why low calorie sweeteners can be a helpful tool in diabetes<sup>30</sup>

Low calorie sweeteners...



...can help you reduce your sugar intake



...do not affect blood glucose levels



...provide low or no calories and can help in calorie reduction



...can be an ally in weight management, when used in place of sugar and as part of a weight loss / maintenance programme



...provide more sweet-tasting options with fewer carbohydrates and calories

<sup>xv</sup> A metabolic disorder occurs when biochemical processes involved in the body's normal functioning become abnormal



## CONCLUSION

LNCS have been extensively studied for their safety and rigorously tested by national and international bodies prior to the approval for use and consumption. Although LNCS are often inaccurately linked to adverse health effects, the weight of the evidence does not support such statements.

While this is an area of interest for scientists and new literature on LNCS are being published, many of the most credible studies may not make the headlines.

Misinformation is one of the biggest drivers that have influenced the negative reputation of LNCS. As such, it is important to examine studies critically in terms of the research designs and how the findings compare to peer-reviewed scientific evidence on the topic independent of the headlines that attract the reader's attention.

The increasing awareness of the link between diet and health, the problem of obesity and concerns over sugar intake have led to the worldwide effort to reduce the consumption of sugar.

The totality of science on LNCS shows that they are safe for consumption and serve as a tool to help people maintain their body weight. This will be increasingly important to improve public health.

In Asia, there are misconceptions around LNCS and this calls for better understanding to create a balanced view on the subject to support consumer choice and aid industry innovation.





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