THE ULTIMATE GUIDE TO KICKING SUGAR

By Flora Zhao

EPOCH HEALTH

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PART ONE

"Sugar is very important for our body and our brain. And I think this is where a lot of the difficulty [in cutting out sugar] lies."

Jessica Russo, clinical psychologist

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CHAPTER 1

Why Your Brain Craves Sugar

"The brain is the most energy-demanding organ, which uses about half of all the sugar energy in the body."

Jessica Russo, clinical psychologist

Our brains often instinctively crave sugar. It could be a slice of cake during times of stress, a bar of chocolate when bored, or a sweetened coffee when needing a pick-me-up. The inability to quit sugar may not stem from a lack of willpower but rather from not fully grasping the nature of sugar and not finding the most effective methods to quit.

Sugar: Fuel for Life

"Sugar is very important for our body and our brain. And I

think this is where a lot of the difficulty lies," Jessica Russo, a clinical psychologist from Philadelphia, told The Epoch Times during an interview.

Sugar serves as the primary energy source for every cell in our body and much of the food we eat is broken down into various sugars.

"The brain is the most energy-demanding organ, which uses about half of all the sugar energy in the body.

"We're biologically driven toward sweet foods," as this is a survival mechanism, Russo said, explaining that in nature, sweet-tasting foods are generally healthy, while toxic foods may taste bitter, and spoiled or rotten foods may taste sour, both of which lack sweetness.

Therefore, when we taste something sweet, our brains signal, "Oh, this is good!"

Besides helping us identify safe food, sweetness also plays a role in human survival and growth.

"We see babies being born with the ability to detect sweet taste and to prefer it," said Julie A. Mennella, a scientist at the Monell Chemical Senses Center in Philadelphia. It indicates that sweetness is associated with the quality of breast milk, which can attract infants to suckle.

There is evidence to suggest that children's preference for sweet foods may be linked to their higher caloric needs during the growth stage, which typically lasts from infancy until the end of puberty, she told The Epoch Times.

Our Brain on Sugar

When we consume sugar, the receptors on our tongues send sweet signals to the brain, triggering the release of dopamine, which can induce feelings of joy and happiness.

"We taste with our brains," Mennella explained. Sweetness makes us feel good because these signals are sent to various parts of the brain, many of which are associated with rewards.

"The brain pathways used are significant for pleasure, memory, and reward," she said.

This means that when we engage in activities that trigger dopamine release, we experience joy, form memories, and look forward to doing it again.

"In the brain, it has very specific actions and is the most important molecule in the brain that's involved in bringing about well-being," said Kenneth Blum, a renowned scientist with a doctorate in neuropharmacology.

Dopamine can also counteract stress, said Blum, who is a professor at the Western University of Health Sciences Graduate College of Biomedical Science, and a part-time professor at the University of Vermont and Wright University.

"When you have stress, the dopamine is released 100 times above the normal rate." It can block the action of stress hormones such as adrenaline.

However, Blum emphasized the importance of maintaining a balance for this crucial molecule; otherwise, the brain could suffer severe negative consequences.

Many people are unaware that excessive sugar con-

sumption can lead to consequences very similar to drug abuse.

Blum explained that excessive sugar consumption can trigger acute dopamine release.

"It's like abusing alcohol or other drugs of abuse," he said. Over time, that can result in a chronic decrease in dopamine levels. Consequently, individuals may seek larger quantities of sugar to experience the same level of pleasure, eventually leading to an addictive state where they consume more and more.

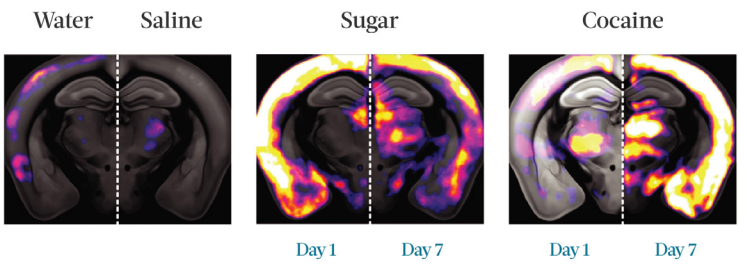
When you consume a large amount of refined sugar, "your brain lights up like a pinball machine due to the intense release of dopamine," said James DiNicolantonio, a cardiovascular research scientist and doctor of pharmacy at Saint Luke's Mid America Heart Institute in Kansas City, Missouri.

When ingesting refined sugar, the sweet receptors signal the brain's reward system more effectively than when eating fruit. The levels of dopamine released by the brain far exceed what we can handle.

In 2023, a study published in the journal Translational Psychiatry revealed that when a mouse drinks water or is injected with saline, the brain remains relatively calm. However, when administered a sucrose solution or injected with cocaine, multiple regions of the brain's neurons become activated (highlighted in the image).

"Our research shows how similarly both additive and nonadditive rewards are processed by our brains, both on the whole-brain scale and on a cellular level," said Anna Beroun, the study's lead author and head of the Laboratory of Neuronal Plasticity at the BRAINCITY Center of Excellence for Neural Plasticity and Brain Disorders, part of the Nencki Institute of Experimental Biology, Polish Academy of Sciences, in Warsaw, Poland."

Brain Activation With Sugar and Cocaine



Source: Translational Psychiatry

Activation of brain neurons in specific regions upon sucrose and cocaine administration.

"Sugar/food becomes addictive if we value it over other rewards."

Is Sugar a Drug?

Sugar is irresistibly alluring, not only because it stimulates the brain to produce dopamine, which brings joy, but also because it triggers the production of endogenous opioids in the brain, which can lead to addiction and dependence.

Blum said that the brain has glucose receptors, and when they are stimulated by sugar, it triggers a series of signaling pathways that ultimately lead to the production

of addictive substances. This mechanism is inherently present "so that if you abuse sugar, you're going to order the brain–reward circuitry in a negative way, as if you use heroin."

An experiment revealed that mice fed large amounts of sugar intermittently exhibited withdrawal symptoms when injected with a drug that blocks opioids. These symptoms included teeth chattering, forepaw tremors, and headshakes.

Sugar's effect on the brain not only shares similarities with drugs but also, in certain circumstances, is even more alluring.

Over the years, French researchers have conducted a series of animal experiments, with the results revealing that when given the choice between cocaine and sucrose, rodents consistently preferred sucrose over cocaine. This preference held even for mice previously addicted to cocaine before the experiments.

"When we over-consume sugar, there is a release of dopamine and endogenous opioids that cause a 'high,' but then we get a 'low.' If we do this over a prolonged period of time, this can lead to dependency on sugar, especially in those who are vulnerable," said DiNicolantonio, summarizing the addictive mechanism of sugar.

When there is a deficiency of dopamine and endogenous opioids, one may feel sad, confused, sluggish, and unable to concentrate, all of which can further drive the desire to consume more sugar.

Additionally, numerous human experiments have demonstrated the link between sugar and addiction.

For example, a prospective observational study published in Addiction Biology in 2021 revealed that a significant proportion of individuals with alcohol use disorder (40 percent) experienced an increased craving for sugar during their inpatient alcohol detoxification.

Additionally, a study published in the journal Addiction showed that children with a family history of alcoholism and depression were more likely to prefer intense sweetness. On average, these children opted for water with a sucrose concentration of 24 percent, equivalent to about 14 teaspoons of sugar in a glass of water—more than twice the sugar concentration found in regular soda water.

In contrast, children without such familial backgrounds preferred water with a sucrose concentration of 18 percent.

The Brain's Sweet Dilemma

Sugar and the brain share an innate strong connection. Unfortunately, modern diets are filled with highly refined sugars that evoke drug-like allure. In fact, the sweetness we consume today differs significantly from what our ancestors experienced.

Russo vividly illustrated the body and brain's conflicting views on sugar with a lively scene, noting that our bodies resist certain sugars while being more receptive to others.

"The brain says, 'We need sugar; we must have sugar;

we can't survive without it.' On the other hand, the body disagrees, saying, 'We don't like all types of sugar,'" she added.

There is an ancient Chinese saying: "If you know the enemy and know yourself, you need not fear the result of a hundred battles." To quit sugar, one must first understand sugar. However, the truth is some sugars and sweet substances are natural and even beneficial to the body.

CHAPTER 2

Natural Sweeteners: Healthy Alternatives to Sugar

Stevia

"Compared to other types of sweeteners, stevia could be beneficial in helping people keep their glucose levels under control or in a healthy range after eating."

Stephen Anton, professor in the Department of Physiology and Aging, University of Florida

Stevia has recently become one of the most popular natural sugar substitutes. Sugar is known to raise blood sugar levels, but stevia can actually lower them. In fact, it was even used to treat diabetes in ancient times.

Stevia is also known as honey leaf, sweet leaf, or sweet herb. According to a paper published in Nutrition Today, it belongs to the sunflower (Asteraceae) family and is native to southern Brazil and northern Paraguay. The indigenous

Guaraní people have been using stevia to sweeten their food and beverages for centuries. According to a 2019 meta-analysis published in Nutrients, they have also used it for medicinal purposes, such as treating diabetes.

Stevia's sweetness mainly comes from steviol glycosides, which are about 200 to 300 times sweeter than sucrose. High-purity stevia extracts contain 95 percent or more steviol glycosides, according to the journal Nutrition Today. A 2023 study published in Molecules found eight different types of steviol glycosides that occur naturally in stevia leaves, with stevioside being the most abundant.

Because of its commercial potential and pharmacological properties, stevia has attracted widespread attention from the food and scientific community. As a result, stevia plantations can now be found in many regions around the world.

Stevia's glycemic index (GI) and calorie content are zero. The glycemic index measures how quickly and to what extent a food increases blood sugar (blood glucose) levels, with glucose being the standard at a GI value of 100.

The Antidiabetic Sweetener

Modern research has found that stevia exhibits antidiabetic activity.

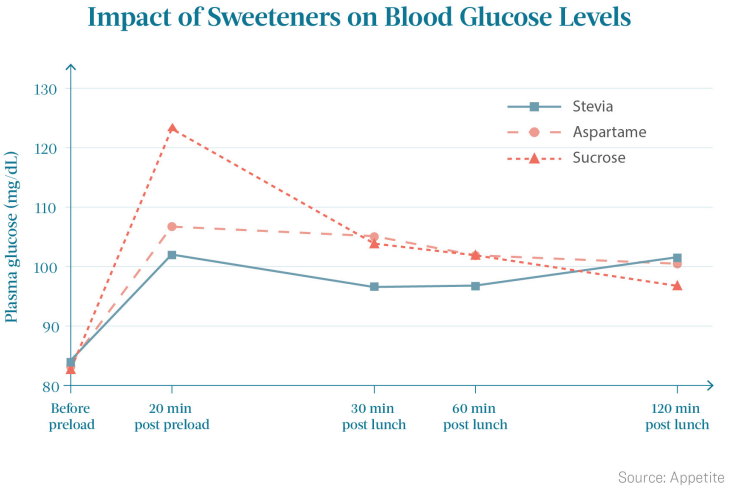
Stevia not only increases insulin secretion and activity but also reduces insulin resistance. It also inhibits or reduces the liver's production of glucose, which helps

maintain healthy blood sugar levels. Additionally, stevioside and steviol found in stevia help regulate certain enzymes involved in glucose metabolism, which may assist in maintaining stable blood sugar levels and preventing extreme fluctuations.

Researchers from the University of Florida conducted an experiment in which 31 adult participants fasted for 12 hours and ate the same breakfast. Twenty minutes before lunch and dinner, they were given tea and snacks containing sucrose, aspartame, or stevia, without knowing which type of sugar they were ingesting. They were then free to eat lunch and dinner as they wished.

Their hunger and satiety levels were evaluated hourly, and blood tests were conducted. All participants completed three days of food tests.

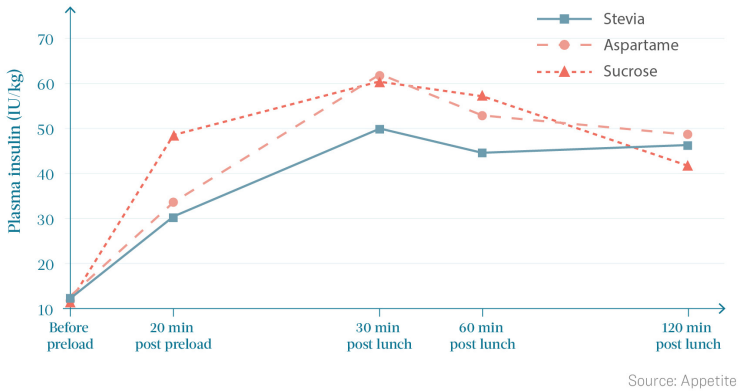
The results showed that participants who consumed stevia had significantly lower blood sugar levels right after



Consumption of stevia resulted in lower blood glucose levels right after lunch.

lunch than those who consumed sucrose, and they had no significant fluctuations.

Impact of Sweeteners on Blood Insulin Levels



Consumption of stevia resulted in lower insulin levels right after lunch.

Additionally, after lunch, the insulin levels of participants who consumed stevia were overall lower than those of participants who consumed aspartame or sucrose.

"It would suggest that compared to other types of sweeteners, stevia could be beneficial in helping people keep their glucose levels under control or in a healthy range after eating," study co-author Stephen Anton, a professor of physiology and aging at the University of Florida with a doctorate in clinical and health psychology, told The Epoch Times. "Compared to sucrose and aspartame, stevia could lead to better post-meal metabolic states."

Moreover, participants who consumed stevia and aspartame had a significantly lower total caloric intake.

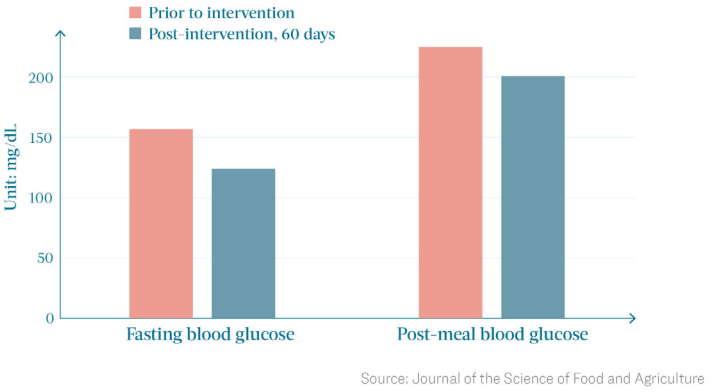
Although participants who consumed stevia before meals didn't gain any calories from it, they didn't compensate by eating more at lunch or dinner compared to those who consumed high-calorie sucrose. Additionally, their feelings of fullness were similar.

A randomized, controlled trial on diabetic patients published in the Journal of the Science of Food and Agriculture in 2016 further demonstrated the blood sugar-lowering effect of stevia. Twenty patients with Type 2 diabetes were randomly divided into two groups, one taking 1 gram of dried stevia leaf powder daily and the other not taking any. The experiment was conducted over 60 days.

The results showed that taking dried stevia leaf powder significantly reduced the fasting and postprandial blood sugar levels of these diabetic patients.

"I see that using stevia as a sugar substitute can bring about a huge change," said Per Bendix Jeppesen, an associate professor in the department of endocrinology and diabetes at Aarhus University in Denmark who is current-

Effect of Stevia on Fasting and Post-Meal Blood Glucose Levels



Consumption of stevia resulted in lower fasting and postprandial blood sugar levels.

ly studying stevia extract as an antidiabetic drug and as a healthy sweetener.

"It is a game changer," he told The Epoch Times.

That's because the main component of stevia has positive effects on the human endocrine system, especially for people with diabetes. In addition to studying stevia's effectiveness and extraction techniques, Jeppesen is involved in related experiments on antidiabetic drugs.

Modern people tend to engage in too little physical activity, consume too much food, and eat diets that are high in sugar and fat.

"Stevia could be a very good substitute for the sugar that we are consuming too much of," Jeppesen said. "By adding stevia, it could really enhance public health, as the calorie intake would decrease when we consume less sugar."

Mitigates Blood Pressure and Cholesterol

In addition to controlling postprandial blood sugar and other antidiabetic effects, stevia can lower blood pressure and blood lipids.

Steviol glycosides found in stevia can regulate the level of calcium in the blood, which can lead to vasodilation and reduced arterial contraction, both of which contribute to lowering blood pressure, according to the 2023 Molecules study.

Researchers in Taiwan conducted a randomized, double-blind, placebo-controlled trial on hypertensive patients in which 174 hypertensive patients were divided into two groups. One group took steviol glycoside capsules three times a day, each containing 500 milligrams of steviol glycoside, while the other group took a placebo. Two years later, those who took steviol glycoside showed significant improvements in their blood pressure. Their systolic blood pressure decreased from an average of 150 to 140 mm Hg, and their diastolic blood pressure decreased from an average of 95 to 89 mm Hg.

Notably, the beneficial effects of steviol glycosides on hypertensive patients were observed approximately one week after the start of the experiment and continued throughout the entire study. Additionally, the group taking steviol glycosides had significantly improved overall quality of life scores, as measured by a survey.

The Nutrients meta-analysis included seven studies and nine randomized controlled trials involving 462 participants. The analysis revealed that compared with taking a placebo, steviol glycosides significantly reduced systolic blood pressure by 6.32 mm Hg and diastolic blood pressure by 3.6 mm Hg. Additionally, there were nonsignificant reductions in body mass index, fasting blood sugar, and total cholesterol.

Stevia can also lower blood lipids. A review study showed that consuming stevia extract can significantly increase the level of high-density lipoprotein ("good" cholesterol) and reduce the levels of total cholesterol, triglycerides, and low-density lipoprotein ("bad" cholesterol).

Stevia's 100+ Protective Compounds

Stevia contains more than 100 compounds, many of which benefit our health. In addition to natural sweeteners and various trace elements, stevia contains terpenes, sterols, tannins, volatile acids, flavonoids, vitamins, enzymes, organic acids, and polysaccharides, all of which have biological activity.

According to the Molecules study, steviol glycosides have been found to suppress and control factors that trigger cell inflammation. They also play a protective role in the liver by preventing inflammation and have been shown to enhance the body's innate immune system.

In addition, steviol glycosides exhibit antioxidant properties. The study published in Molecules in 2023 demonstrated that they can protect heart cells from damage caused by hydrogen peroxide, a reactive oxygen species produced during normal metabolic processes. Excess hydrogen peroxide can lead to oxidative stress, damaging cells and tissues. The steviol glycosides not only help protect heart cells, leading to increased vitality and improved antioxidant capacity, but they also prevent oxidative DNA damage in the liver and kidneys.

Sweet With Minimal Side Effects

According to a paper published in the Experimental and Clinical Sciences (EXCLI) Journal, Paraguayans have been

consuming stevia continuously for more than 1,500 years with almost no adverse effects reported. Additionally, a review study indicates that most reports on stevia consumption don't suggest any adverse events.

According to the U.S. Food and Drug Administration (FDA), highly purified steviol glycosides are generally recognized as safe (GRAS). However, stevia leaf and crude stevia extract are not considered GRAS "due to inadequate toxicological information." The FDA regulates these as food additives rather than as dietary ingredients or supplements.

In other countries like Japan, Australia, and Brazil, stevia leaf-derived products are approved for use as sweeteners in food. They are used in a variety of foods, including teas.

The acceptable daily intake of steviol glycosides, as defined by the FDA and the European Food Safety Authority, is 4 milligrams per kilogram of body weight, or approximately 1.8 milligrams per pound.

Jeppesen stated that these agencies took more than 10 years to conduct rigorous evaluations before listing stevia as a food additive. However, stevia extract has been widely used as a sweetener in Japan since the 1980s.

An earlier rat study mentioned in the EXCLI Journal suggested that stevia might affect the fertility of experimental animals. However, Jeppesen said that the final results of these studies generally weren't accepted.

How to Choose Stevia Sweetener

Stevia plants. (casa.da.photo/Shutterstock)

Despite stevia's benefits, not all stevia products available for sale are high quality.

Some products have been found to contain artificial sweeteners sodium saccharin and sodium cyclamate. In addition, crude stevia extracts may have a higher allergenic potential than high-purity stevia sweeteners containing at least 95 percent of steviol glycosides.

Because stevia is so sweet, most stevia products found in supermarkets are blended formulas. Steviol glycosides generally account for only about 1 percent of powdered products, while the remaining ingredients are usually sugar alcohols such as erythritol and xylitol. Certain products may also contain a combination of steviol glycosides and cane sugar or raw sugar.

Liquid-based stevia products mainly contain water

and may also contain some preservatives such as alcohol. Colorless and transparent products are formulated using steviol glycosides as raw materials; products that are green in color are more likely to be directly extracted from the stevia plant.

Jeppesen recommended choosing products that combine soluble fiber and steviol glycosides for a calorie-free sweet taste and additional fiber intake. Also, the application and preparation methods of these products are similar to those of sugar, making them a practical alternative for use in cooking.

Some stevia products have a metallic or bitter taste from the stevioside compound.

Jeppesen said that the taste of steviol glycoside products will continue to improve as extraction technology advances. In fact, the aftertaste of metallic or bitter flavors can now be eliminated. In the future, there'll be more and more steviol glycoside products available to choose from.

Growing Stevia Plants at Home

How can stevia plants be grown at home?

Stevia is a hardy plant that will thrive under the right conditions. Provided with adequate light and well-draining, lightweight soil, stevia plants will produce more leaves with higher levels of steviol glycosides.

Stevia leaves contain eight different steviol glycosides, with rebaudioside A noted for its more pleasant taste compared to stevioside. In recent years, high-quality stevia va-

rieties with a higher rebaudioside A content than stevioside have been developed.

When the stevia flowers blossom, the leaves are less sweet. According to a study published in Applied Microbiology and Biotechnology, this is due to a significant decrease in the levels of sweet compounds in the leaves during the flowering process.

Adjusting watering levels and applying organic fertilizers based on temperature and humidity is also essential. Stevia is not cold tolerant, so it should be moved indoors during winter or have a thick layer of straw mulch added to its roots for insulation.

Stevia leaves contain eight different steviol glycosides. (Take Photo/Shutterstock)

For inexperienced growers, starting with stevia seeds can pose obstacles, as they are quite difficult to germinate; it might be more convenient to propagate stevia through stem cuttings or purchase stevia seedlings directly.

Monk Fruit

"During the summer, it is recommended to consume monk fruit when experiencing symptoms such as sore throat, throat discomfort, or cough."

Jonathan Liu, director, Liu's Wisdom Healing Centre

Following in stevia's footsteps, monk fruit has gained widespread attention as a natural sweetener. One significant benefit of this sweetener is that it can manage blood sugar and lipid levels. It also might have antiviral effects against COVID-19 and even anti-cancer properties.

Monk fruit is also known as luo han guo, and its fruit resembles a small melon on the outside. Ancient Chinese people used it for centuries as a natural sweetener and traditional medicine.

According to a review article in Frontiers in Pharma-

cology, monk fruit contains various nutritious compounds, including mogrosides, vitamin C, trace elements, linolenic acid, and other unsaturated fatty acids.

"Monk fruit does actually contain natural sugars. Those are mainly fructose and glucose. However, unlike most fruit, the natural sugars from monk fruit aren't really responsible for the sweetness. Instead, the intense sweetness comes from a group of compounds called mogrosides," Taylor Wallace, an adjunct associate professor at the Friedman School of Nutrition Science and Policy at Tufts University and CEO at the Think Healthy Group, LLC, told The Epoch Times.

"The extracted mogrosides from monk fruit, obtained through processing, don't necessarily contain fructose or glucose. So these are very similar compounds to what you would see in other high-intensity sweeteners," Wallace said.

Mogrosides are 200 to 350 times sweeter than sucrose, and monk fruit sweetener is essentially derived from mogrosides. Mogrosides account for about 1.2 percent of the fresh monk fruit and 3.8 percent of dried fruit powder, according to a review published in Molecules.

"Mogroside, as a natural sweetener derived from plants, is a series of molecules, and the taste of these molecules is different," Nate Yates, vice president of the Global Sugar Reduction Platform at Ingredion Inc., told The Epoch Times.

Mogroside V is the most abundant of the compounds, and ripe monk fruit is exceptionally sweet because of its high content of mogroside V, according to the Molecules

review.

"After further refinement and extraction, the taste is more pure and pleasant," Yates said.

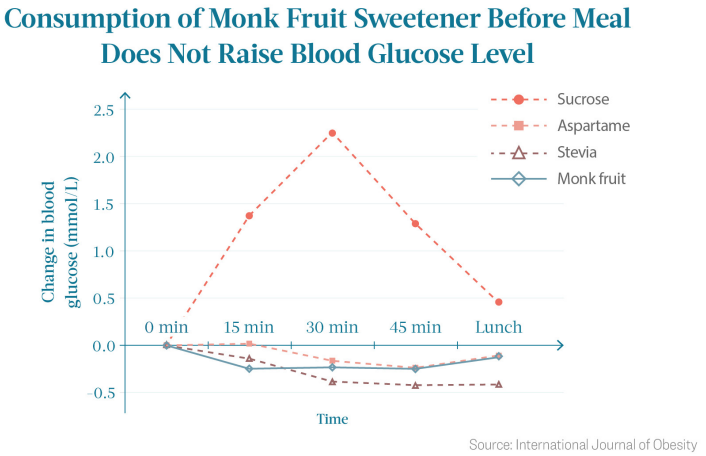
Monk Fruit: Diabetes-Friendly Delight

Like stevia, monk fruit is a zero-calorie sweetener. It is often described as having a taste similar to that of cane sugar, which is a high-calorie sweetener.

In a randomized controlled trial published by the International Journal of Obesity in 2017, 30 healthy men were asked to consume a standardized breakfast, and one hour before lunch, they were provided beverages containing sucrose, aspartame, stevia, or monk fruit sweetener. They were then allowed to choose their lunch from the options provided, and their dinner was recorded. In addition, blood draws and appetite measures were conducted at various points throughout the study.

The results showed that those who consumed beverages containing sucrose experienced an increase in blood sugar and insulin levels within an hour before a meal, and those who consumed beverages containing one of the other sweeteners, including monk fruit, did not.

After subsequent monitoring, the researchers concluded that natural sweeteners, including monk fruit sweetener, had the most negligible effect on post-meal blood sugar levels and insulin secretion compared with sucrose.



Consuming monk fruit sweetener one hour before a meal does not increase blood sugar levels.

A recent systematic review and meta-analysis conducted by Canadian researchers showed that in the short term, like water, beverages sweetened with noncaloric artificial or natural sweeteners didn't affect metabolism and endocrine function.

There is currently limited human research on monk fruit sweeteners, unlike stevia. However, numerous cellular models and animal experiments have indicated that mogrosides provide various beneficial effects for both Type 1 and Type 2 diabetes, according to a review published in the journal Foods.

Mogrosides have been shown to regulate lymphocyte antigens in Type 1 diabetic mice and exhibit therapeutic effects on symptoms. Monk fruit extract can also alleviate and repair damage to pancreatic beta cells and promote insulin secretion, according to the Frontiers in Pharmacology review.

According to the Molecules review, mogrosides have been found to effectively reduce blood sugar and lipid levels in people with Type 2 diabetes. In a study involving mice with diabetes, those given monk fruit extract or mogrosides experienced significant decreases in fasting blood sugar, glycated serum protein, and insulin resistance. The treatment also resulted in a reduction in LDL cholesterol and an increase in HDL cholesterol levels. Additionally, mogrosides can alleviate symptoms of diabetic nephropathy, according to the Frontiers in Pharmacology review.

Monk fruit beverages, made from monk fruit powder and water, have already been granted patent registrations in China. The review published in Frontiers in Pharmacology suggested that such drinks are suitable for people with diabetes.

Moreover, according to the Foods review, the flavonoid compounds found in monk fruit can significantly lower blood sugar levels and protect the pancreas, while the polysaccharides can ameliorate lipid disorders and reduce plasma glucose levels.

A Promising Natural Approach to COVID-19

Monk fruit has long been used in traditional Chinese medicine (TCM) to treat cough, sore throat, bronchitis, and asthma. According to the Frontiers in Pharmacology

review, records of its effectiveness in relieving phlegm, alleviating pain, clearing heat, and moisturizing the lungs—key concepts in TCM—can be traced back 2,000 years.

"In particular, during the summer, it is recommended to consume monk fruit when experiencing symptoms such as sore throat, throat discomfort, or cough," Jonathan Liu, a professor of Chinese medicine at Georgian College and the director of Liu's Wisdom Healing Centre in Canada, told The Epoch Times.

A study published in Frontiers in Endocrinology in 2022 demonstrated that mogroside V can effectively target multiple sites of COVID-19, potentially helping treat those infected with the virus.

Mogrosides can also inhibit the release of inflammatory factors, effectively suppressing and reducing pulmonary fibrosis.

According to the Molecules review, numerous animal studies have demonstrated that monk fruit extract can significantly inhibit cough and enhance sputum excretion. It also possesses anti-inflammatory properties and can help manage asthma. Additionally, mogrosides show a protective effect against acute lung injury.

Wide-Spectrum Protection and Benefits

Anti-Cancer

Mogrosides exhibit comprehensive anti-cancer activities, as evidenced by various experiments. According to the review in Foods, they can inhibit the invasion and migration of lung cancer cells, induce cell apoptosis, and impede the proliferation of colorectal and laryngeal cancer cells. Moreover, mogrosides can disturb the growth cycle of pancreatic cancer cells and cause cell death. According to the Frontiers in Pharmacology review, monk fruit extract has also been found to have inhibitory effects on liver cancer.

Additionally, mogrosides can help inhibit the toxicity of carcinogens, according to a paper published in Cancer Letters. For instance, they can help prevent skin cancer induced by exposure to certain chemicals, according to commentary published in Future Medicinal Chemistry.

Animal studies mentioned in the Cancer Letters paper have shown that phytochemicals in monk fruit can even directly kill tumor cells.

Improves Cognitive Health

Mogrosides can alleviate neuroinflammation in brain cells and help manage Alzheimer's disease, according to the Molecules review. They can also reduce memory impairments and prevent hippocampus apoptosis. In addition, animal studies mentioned in the Foods review have shown that mogrosides can effectively improve schizophrenic behaviors in mice and modulate partial permanent impairment of the nervous system.

Powerful Antioxidant

The Molecules review states that mogrosides are antioxidant agents, enabling them to scavenge reactive oxygen species and protect cells. They can also inhibit DNA oxidative damage, thereby slowing the aging process. Additionally, mogrosides demonstrate significant protective effects against exercise-induced tissue damage, including cardiac injury. The Foods review indicated they could also improve nonalcoholic fatty liver disease by preventing liver fat accumulation and inhibiting lipid peroxidation.

In addition, the flavonoids and polysaccharides found in monk fruit also show vigorous antioxidant activity.

Who Should Avoid Monk Fruit Sugar?

"Monk fruit sweetener seems to be fairly safe, though it undergoes an artificial extraction process," Wallace said.

According to the information published by the FDA, monk fruit extract is classified as "generally recognized as safe." However, no specific acceptable daily intake has been established for monk fruit extract, which is typical because evidence of the ingredient's safety is established for amounts well above that needed to achieve the desired effect in food.

According to TCM, monk fruit is considered to have a slightly cold nature and is associated with minimal side

effects. However, Liu advised that people with cold constitutions, such as those who frequently experience loose stools, have a large, pale tongue, or exhibit prominent tooth marks on the edges of the tongue, may want to avoid monk fruit consumption.

In addition, monk fruit belongs to the Cucurbitaceae family, which includes common plants such as cucumber, zucchini, pumpkin, and melon. Therefore, people allergic to these foods are more likely to be allergic to monk fruit.

What to Know When Buying Monk Fruit

Monk fruit offers numerous health benefits, but its cultivation can be challenging. It has low germination rates and requires specific environmental conditions for successful growth.

Fresh monk fruit is also tough to store and rarely seen in the market. However, dried monk fruit can be found in some Asian grocery stores, Chinese herbal medicine stores, and online.

The traditional drying method for monk fruit involves high-temperature hot air drying. However, in recent years, there has been a rise in the use of low-temperature freeze-drying for dried monk fruit, which helps retain a higher concentration of beneficial compounds, especially mogrosides.

Because of their potent sweetness, solid powdered

monk fruit sweeteners commonly found in supermarkets are often mixed with other substances such as erythritol, and some products may even contain sucrose. Monk fruit may only account for about 1 percent of the composition of these products.

Homemade Monk Fruit Recipe

You can also try making homemade monk fruit syrup using dried monk fruit.

1. Remove the peel of the monk fruit and extract the flesh and seeds. Soak the monk fruit flesh and seeds in 194 F (90 C) water for 30 minutes at a ratio of 1 gram of dried fruit to 15 milliliters of water, as described in the Foods review. Then, strain the liquid and store it for later use.
2. Afterward, you can pour in fresh hot water and continue soaking the flesh and seeds, but remember to extend the soaking time appropriately with each subsequent infusion.
3. By boiling the infused monk fruit water, you can reduce it to obtain monk fruit syrup.

Another simple way to incorporate monk fruit is by adding dried monk fruit to your tea during brewing. This makes the tea sweeter and provides the benefits of monk fruit's compounds.

Monk fruit or luo han guo. Dried fruits for a healthy, sweetened drink. (gnepphoto/Shutterstock)

CHAPTER 3

Natural Sugars: Honey, Maple, and Coconut

Honey: When Sugar Is Not Sugar

"Honey should not be categorized as free sugar. It is different."

Tauseef Khan, research associate, University of Toronto

Currently, most health organizations, including the World Health Organization (WHO) and the FDA, still classify honey as either free sugar or added sugar. Although honey contains a significant amount of sugar, it differs from regular sugar. Numerous studies and experts have indicated that honey may benefit metabolism, specifically by reducing blood sugar levels.

Honey's Unique Composition

Honey is a delightful gift from nature. With variations based on the source plants and other factors, there are more than 300 types of honey worldwide.

In general, honey is made up of about 17 percent water, and 95 percent to 99 percent of the remaining dry matter is sugar. Among these sugars, the major components are fructose and glucose. On average, 100 grams of honey contains approximately 38.5 grams of fructose and 31 grams of glucose.

Notably, 14 percent of the sugars in honey are rare sugars, many of which are formed during its maturation process. These rare sugars are uncommon in nature and are believed to have beneficial health effects.

"Honey should not be categorized as free sugar. It is different," Tauseef Khan, a research associate in the Department of Nutritional Sciences at the University of Toronto's Temerty Faculty of Medicine, told The Epoch Times.

Khan said honey is a "complex mixture of sugars" and that rare sugars, which have unique benefits, aren't complex carbohydrates but are usually found in the form of monosaccharides or disaccharides. These sugars possess potential metabolic effects, and many also serve as prebiotics.

Compared with regular sugar, honey can lower fasting blood sugar levels, reduce bad cholesterol, and raise good cholesterol.

"Those effects are very surprising; if it was normal

sugar, then those effects should not have been there," Khan said.

In a statement discussing the discovery that honey can reduce cardiometabolic risk, John Sievenpiper, associate professor of nutritional sciences and medicine at the University of Toronto, said: "The word among public health and nutrition experts has long been that 'a sugar is a sugar.' These results show that's not the case."

Honey's Glycemic Magic

The glycemic index (GI) of glucose is 100, while sucrose averages about 66 and fructose 24. Because of variations in sugar composition, the GI values of different types of honey fall within the range of 35 to 74, with an average of 60.

Interestingly, because of its high level of fructose, honey is 25 percent sweeter than sugar.

Nevertheless, honey has lower GI values and calorie content than refined sugar.

Fructose has a bad reputation that may be unwarranted. Researchers at the University of Toronto published a study in The American Journal of Clinical Nutrition reviewing 169 clinical trials related to fructose. The study concluded that naturally occurring fructose found in fruits and honey isn't likely to contribute to weight gain and may even positively affect weight loss. Another review study published in Molecules indicated that fructose in honey may slow intestinal absorption, prolong gastric emptying,

and reduce food intake. Additionally, fructose in honey was found to enhance the liver's metabolic capacity for glucose.

Honey Versus Sugar: Diabetic Effects

Using honey as a substitute for refined sugar in one's diet offers additional benefits.

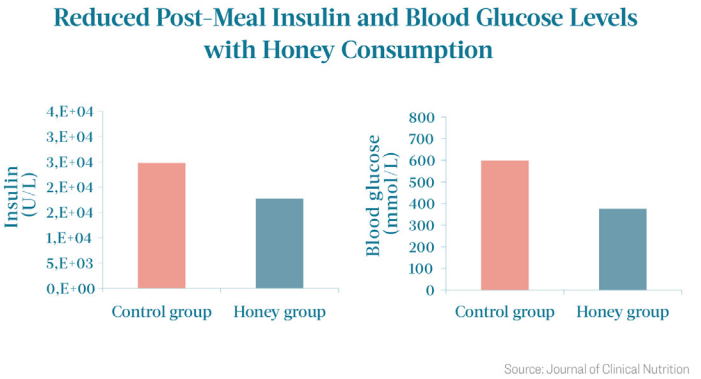
The blood sugar-lowering and antidiabetic effects of honey have been proven in both animal and human studies.

In a 2008 study, 55 overweight or obese people were divided into two groups, with one group receiving a daily intake of 70 grams of sucrose and the other receiving 70 grams of honey, both for 30 days. The results showed that compared with the pre-intervention period, the group consuming honey experienced a 4.2 percent decrease in fasting blood sugar levels and improved insulin resistance. Honey also resulted in a slight reduction in body weight and body fat percentage by 1.3 percent and 1.1 percent, respectively, alongside a 3 percent decrease in total cholesterol, an 11 percent decrease in triglycerides, and a 3.3 percent increase in good cholesterol.

On the other hand, people who received sucrose experienced different changes. Not only did their fasting blood sugar levels rise by 2.2 percent, but their body weight and body fat percentage also increased.

According to a controlled experiment published in

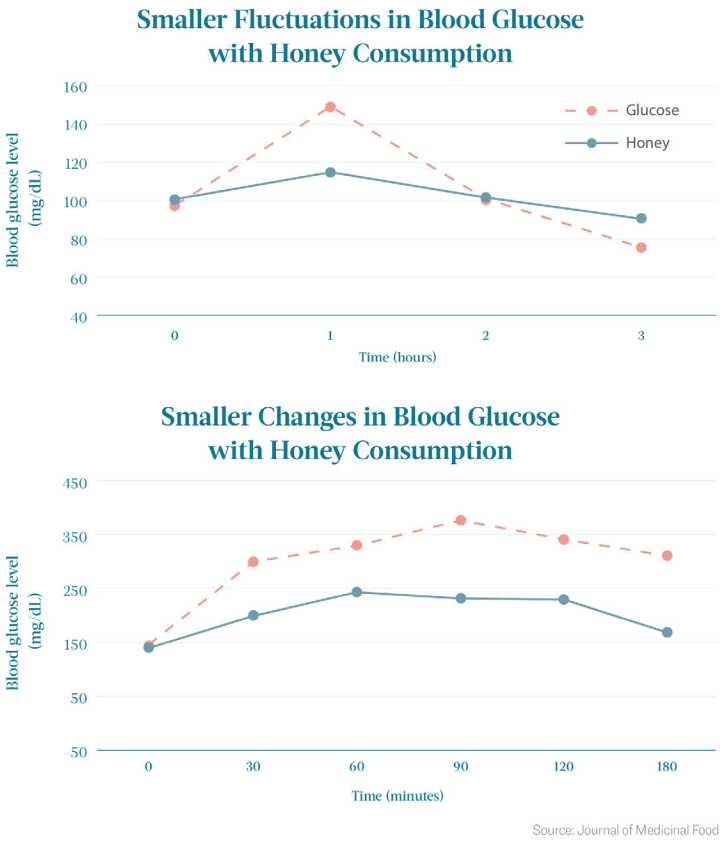
2017, healthy adults who replaced 25 percent of their dietary carbohydrates with honey for eight consecutive days experienced decreased postprandial (post-meal) insulin and blood sugar levels.



Replacing carbohydrates with honey results in decreased postprandial blood sugar and insulin levels.

In another experiment comparing honey and glucose effects on diabetic and healthy people, healthy subjects were given an equal quantity of honey or glucose. The results revealed that honey intake resulted in significantly smaller fluctuations in blood sugar and insulin levels than glucose consumption. After consuming honey for 15 consecutive days, healthy people experienced an average 6 percent decrease in blood sugar levels compared to their levels before honey consumption. Diabetic patients also exhibited noticeably smaller changes in blood sugar levels when consuming honey instead of glucose.

In a long-term intervention trial conducted in Egypt, 20 participants diagnosed with diabetes drank honey water, prepared by dissolving 50 milliliters (3 tablespoons) of



Both healthy individuals and diabetic patients experienced smaller fluctuations in blood sugar levels when consuming honey.

honey in water, on an empty stomach twice per day before meals. They consumed an additional 25 milliliters of honey as the sole sweetener in their diets.

During the trial, none of these patients experienced diabetic ketoacidosis or hyperglycemic hyperosmolar state (common symptoms include dry skin or tongue, fruity breath, drowsiness, confusion, difficulty breathing, rapid heartbeat, abdominal pain, and vomiting). Long-term

consumption of honey led to weight reduction, controlled blood pressure, and improved cardiovascular conditions in all patients.

A 2018 review published in Oxidate Medicine and Cellular Longevity revealed that honey has beneficial effects on diabetes, a complex disease. Compared with sugar, consuming honey can reduce weight and lower blood sugar levels in both healthy people and patients with diabetes. A systematic review and meta-analysis published in Nutrition Reviews in 2022 also confirmed the positive effects of honey on blood sugar and metabolism.

How Does Honey Mediate Blood Sugar?

How can honey lower blood sugar levels, despite being a type of sugar?

Khan explained that honey contains 30 to 40 different types of rare sugars, which play a role in regulating appetite-related hormones and insulin secretion, ultimately promoting glucose metabolism.

These rare sugars can help mitigate the effects of fructose and glucose, resulting in lower fasting blood sugar levels and improved blood sugar control. Some of these sugars also nourish beneficial gut bacteria, while others have immune-enhancing properties.

The compounds and flavonoids found in honey possess antioxidant properties that can improve the progres-

sion of diabetes caused by oxidative stress and metabolic disorders associated with the condition. Interestingly, the antioxidant capacity of honey is associated with its color, with darker honey having a higher antioxidant value.

The trace elements found in honey, such as zinc and selenium, are also believed to contribute to blood sugar control.

Specific proteins present in honey can activate the body's innate immune system.

Raw Versus Processed Honey: What's the Difference?

Khan said the data suggest that raw honey has more benefits than honey that has undergone high-temperature processing. Those who consume processed honey also experience benefits, "but they might be more muted or less."

Raw honey retains more of its beneficial components and bioactivity, while the processing of regular honey can alter its composition and reduce its bioactivity.

During production, honey is often briefly heated to reduce moisture and yeast content, but this process can also lower the amount of diastase enzyme in the honey. Diastase aids in the breakdown of starch, and its reduction may affect the honey's overall bioactivity.

Heat processing of honey can lead to an increase in a substance known as hydroxymethylfurfural (HMF). When metabolized in the human body, HMF can convert into a

genotoxic compound, diminishing honey's beneficial effects.

During heat processing, the beneficial bacteria present in honey are also reduced.

Some of the antioxidant compounds in honey are also lost during heat processing and can diminish honey's ability to promote metabolism and lower fasting blood sugar levels. One study showed that heat processing can reduce the antioxidant capacity of honey by 33.4 percent.

Khan emphasized that choosing honey from a single floral source ensures that "the composition of honey will be consistent," making it easier to derive specific benefits.

He said honey sourced from multiple floral origins may come from different regions, suppliers, or even countries, resulting in significant variations in their rare sugar content. Mixing honey from different sources diminishes its overall benefits. The aforementioned review study from 2022 indicated that, within a healthy dietary pattern, honey from a single floral source, particularly acacia and clover, can improve blood sugar control and lipid levels.

According to Khan's research, optimal benefits were observed when people consumed roughly 2 tablespoons, or about 40 grams, of honey per day as a replacement for sugar.

Honey: Ancient Medicine

"We've already got this great gift from nature that is a solution to superbugs. ... Bacteria quickly learn how to fight off the effects of the antibiotic drugs, but they don't have honey resistance."

Nural Cokcetin, research fellow, Australian Institute for Microbiology

Honey is a sweet food and medicine that nature has gifted us. Its history of medicinal use can be traced back 8,000 years. Sometimes, the therapeutic effects of honey surpass even those of medications, particularly the outstanding antibacterial and antiviral properties.

Naturally Superior to Antibiotics

"Bacteria quickly learn how to fight off the effects of the antibiotic drugs, but they don't have honey resistance," Nural Cokcetin, a research fellow at the Australian Institute for Microbiology and Infection in the science faculty at the University of Technology Sydney, said in an interview with The Epoch Times.

Honey has been used to treat skin problems and wound infections for thousands of years. For instance, ancient Greeks and Egyptians would apply honey topically to the skin to treat wounds and burns. Honey's effectiveness in treating wounds and eczema was also documented in Persian traditional medicine. Interestingly, the concept of microorganisms such as bacteria and fungi causing wound infections during those historical periods might not have even been known.

The broad-spectrum antibacterial activity of honey has been increasingly recognized and substantiated. In recent years, the prevalence of wound infections caused by antibiotic-resistant bacteria has become a major global health care challenge. Honey can disrupt biofilms that are formed by these resistant bacteria and sometimes penetrate the biofilm structure to eliminate the embedded bacteria. An article published in the journal of the American Society for Microbiology in 2020 reported no documented cases of bacteria developing resistance to honey.

In clinical settings, medical-grade honey has been utilized in various ways. It's formulated into topical ointments, dressings, and bandages for the treatment of post-

operative wound infections, burns, necrotizing fasciitis, nonhealing wounds, boils, venous ulcers, diabetic foot ulcers, eczema, psoriasis, and dandruff. Additionally, it has proven effective in both preventing and treating infections caused by multidrug-resistant microorganisms.

In vitro studies have shown that honey can kill Helicobacter pylori. Furthermore, eating honey can reduce the duration of bacterial diarrhea.

(Africa Studio/Shutterstock)

Key Antimicrobial Components

The antibacterial properties of honey originate from its inherent characteristics and a diverse array of components derived from both nectar-producing plants and bees themselves. Additionally, some of these components are formed during the maturation process of honey.

High Viscosity and pH

Honey has a high sugar content, reaching up to 82.5 percent. As a result, it has a viscous and syrupy consistency, exhibiting hygroscopic properties (ability to absorb moisture) and high osmolarity. Bacteria that come into contact with honey undergo dehydration and ultimately perish.

Honey is acidic due to its various organic acids, with a pH value ranging from 3.2 to 4.5. Bacteria can't survive in honey; their optimal pH typically ranges between 6.5 and 7.5.

Honey's Weapon: Hydrogen Peroxide

An important enzyme in honey derived from bees facilitates the oxidation of glucose, resulting in the production of hydrogen peroxide.

Hydrogen peroxide is an effective bactericidal agent that can inhibit and kill microorganisms.

Interestingly, water is necessary to induce honey's hydrogen peroxide production. The maximum level of hydrogen peroxide can be obtained by diluting honey to a concentration of 30 percent to 50 percent, according to a paper in the International Journal of Microbiology.

Bee Defensin-1

Bee defensin-1 is another natural antibacterial component

in honey originating from the honeybee's hypopharyngeal gland.

Bee defensin-1 is an antimicrobial peptide that can kill various bacteria and microorganisms. Specifically, the defensin protein has been shown to create pores within the bacterial cell membrane, leading to cell death.

Additionally, bee defensin-1 can aid in wound healing by stimulating keratinocytes, the most common type of skin cell.

Manuka Honey: Enhanced Antibacterial

Manuka honey is often mentioned in studies regarding the antibacterial effects of various kinds of honey. As a globally recognized honey with high antibacterial potency, it possesses a unique natural component called methylglyoxal (MGO).

After honeybees gather nectar from the flowers of manuka trees, a natural substance that's found in the trees undergoes spontaneous dehydration, leading to the formation of MGO in the honey.

"The more of [methylglyoxal] there is, the more antibacterial that honey is," Dee Carter, a professor from the School of Life and Environmental Sciences at the University of Sydney, told The Epoch Times.

MGO exhibits remarkable antibacterial properties by itself. It can alter the structure of bacterial fimbriae and

flagella (appendages), and induce damage to the bacteria's cell membranes, ultimately resulting in cell death.

However, this substance is sensitive to heat. Heating manuka honey to 98.6 degrees Fahrenheit (37 degrees Celsius) can increase the levels of MGO, but heating it to 122 degrees Fahrenheit (50 degrees Celsius) results in the loss of MGO.

Manuka honey possesses a unique compound derived from the manuka tree called methylglyoxal (MGO), an antibacterial compound not found in other types of honey. (HikoPhotography/Shutterstock)

Honey's Benefits Regarding COVID-19

Honey not only possesses antibacterial properties but also exhibits antiviral effects, which help protect the body and boost the immune system. Many individuals find relief

from symptoms of cold and respiratory illnesses by consuming honey water, and there's a valid basis for this remedy.

MGO can inhibit the growth of enveloped viruses, including the virus that causes COVID-19.

According to a study published in the Eurasian Journal of Medicine and Oncology in 2020, computer simulations revealed that multiple compounds found in honey can bind to the protease of SARS-CoV-2, effectively inhibiting its replication.

MGO in manuka honey can also inhibit the replication of influenza viruses, including drug-resistant strains.

Currently, scientists are researching the potential of MGO for managing and treating COVID-19.

Honey can activate several immune cells, enabling them to eliminate viruses effectively. For example, oligosaccharides present in honey can enhance the activity of natural killer cells. Additionally, certain immune cells can "remember" specific viruses during the antiviral response, offering future protection against the same viral invasions.

Honey encourages the proliferative activity of immune cells, thus increasing their quantity.

Honey can promote autophagy, which is crucial in combating deadly viruses such as SARS-CoV-2, which causes COVID-19. It's an internal cellular process that involves the degradation and metabolism of cells, allowing for the removal and recycling of unwanted or damaged cells and impurities. This process contributes to the generation of healthier cells and promotes recovery.

Honey: Good in the Mouth and Gut

Inflammation is a common occurrence in bacterial or viral infections. Left unchecked, it can significantly harm the body, potentially leading to life-threatening complications.

Moreover, honey has been suggested to have a dual role in inflammation control: It can downregulate anti-inflammatory factors, thereby reducing inflammation damage and stimulating the production of inflammatory mediators, promoting wound healing.

In one of Cokcetin's studies, honey could reduce inflammation levels in the intestines. She attributed this effect to the abundant presence of phenolic compounds found in honey.

She explained that honey also contains oligosaccharides and polysaccharides, which are complex sugars. These compounds serve as prebiotics, supporting the growth of beneficial bacteria in the gut and inhibiting the growth of harmful bacteria. Additionally, consuming honey promotes the production of short-chain fatty acids in the intestines.

The UMF Factor: How to Choose Your Honey

Generally, raw and darker honey varieties tend to have more robust efficacy.

Commercially available honey found on supermarket

shelves differs from raw honey sold by beekeepers or at farmers markets, as it's generally pasteurized. Research has shown that heat processing can lower the antioxidant capacity of honey by 33.4 percent. Alternatively, you can also choose honey processed using high-pressure techniques.

Honey comes in a diverse range of colors, from light yellow to amber to dark red, and even nearly black. These colors reflect the varying composition of honey, such as polyphenols, minerals, and pollen. Numerous studies suggest that dark-colored honey generally contains higher levels of phenolic compounds and exhibits more potent activity.

To obtain manuka honey with exceptional antibacterial properties, it's recommended to opt for pure honey sourced from New Zealand and Australia.

The manuka tree is exclusive to specific New Zealand and Australian regions, and its annual yield is limited. Certain products labeled as manuka honey may contain blends of other honey types, potentially affecting the honey's properties. Furthermore, some of these products may even include low-quality ingredients such as sucrose.

Opting for single-origin honey sourced exclusively from the manuka tree and checking for its Unique Manuka Factor (UMF) rating is recommended. A higher UMF rating indicates higher levels of substances related to MGO. Some honey products also specify the amount of MGO in milligrams per kilogram.

However, manuka honey with a higher UMF rating may have a strong flavor that some people find pungent.

Cokcetin recalled that when she began her research on the antibacterial properties of honey, a professor she worked with said, “We’ve already got this great gift from nature that is a solution to superbugs; we just have to figure out how it works and why it works the way it does.”

Maple Syrup

"If you're stranded on a deserted island and could bring only one food, maple syrup is the food for you."

Navindra Seeram, chair of the Department of Biomedical and Pharmaceutical Sciences, University of Rhode Island College of Pharmacy

Maple syrup is undeniably sweet and tasty. Perhaps you're like Ross from "Friends," often finding yourself indulging in a box of maple candies to the point of intoxication. (If not, don't start: This is a bad idea.) When consumed in moderation, maple syrup is indeed healthier than standard refined sugar.

Some might even consider maple syrup a superfood.

"If you're stranded on a deserted island and could bring only one food, maple syrup is the food for you,"

Navindra Seeram, professor and chair of the Department of Biomedical and Pharmaceutical Sciences at the University of Rhode Island College of Pharmacy, said during an interview with The Epoch Times.

How Is Maple Syrup Made?

Maple syrup is a natural sweetener extracted from the sap of maple trees, collected and concentrated without the addition of any chemicals. The method for collecting maple sap and making syrup was introduced to early North American settlers by Native Americans. It takes about 40 liters of tree sap to make 1 liter of maple syrup.

Sap collecting to make maple syrup typically starts in late winter or early spring, usually from February to March, and lasts only a few weeks. Maple trees accumulate starch during growth, which is converted into sugar during the spring thaw. This sugar then mixes with water absorbed by the tree's roots to form maple sap. As the pressure changes due to rising temperatures and the ground thawing, maple producers bore holes into the tree, and taps are installed, allowing the sap to flow from the trunk.

Maple syrup can vary significantly from region to region and tree to tree. Fascinatingly, maple syrup's characteristics continuously evolve throughout the entire harvesting season. At the beginning of the season, the syrup is relatively clear with a slight sweetness. As the season progresses, the syrup becomes darker and develops a range

of distinct flavors, including vanilla, hazelnut, floral, and coffee, and can even be spicy.

Canada is responsible for about 75 percent of the world's maple syrup production, and its syrup is classified into two primary grades: Canada Grade A and Canada Processing Grade. Then, Canada Grade A is further graded into four color classes:

- **Golden:** delicate flavor
- **Amber:** rich flavor
- **Dark:** robust flavor
- **Very dark:** strong flavor

Canada Processing Grade maple syrup doesn't have color classes and is commonly used for large-scale commercial applications.

Holes are bored into the trunks of maple trees to tap maple sap.
(Marc Bruxelle/Shutterstock)

The Composition of Maple Syrup

Based on data from the U.S. Department of Agriculture (USDA), sugars comprise about 60 percent of maple syrup, while water accounts for 32 percent.

Maple syrup contains three types of sugars: sucrose, glucose, and fructose. Sucrose is a disaccharide composed of one glucose molecule and one fructose molecule, accounting for 98.3 percent of all sugars in maple syrup, followed by glucose (1.1 percent) and fructose (0.6 percent).

While sucrose makes up most of the sugar in maple syrup, the GI of maple syrup is lower than that of sucrose, with maple syrup having a GI value of 54 and sucrose having an average GI value of 66. This means that consuming an equal amount of maple syrup compared to sucrose would result in a relatively smaller increase in blood sugar levels.

"Maple syrup is a much better option than refined sugar. It's actually sweeter, which is beneficial because you can get away with using less of it," Amy Gonzalez, a registered U.S. dietitian, told The Epoch Times. In other words, a smaller amount of maple syrup is required to achieve the same level of sweetness compared to refined sugar.

She explained that we can reduce the amount by a quarter when using maple syrup as a substitute for regular sugar in cooking. For example, if a recipe requires 1 cup of white sugar, ¾ cup of maple syrup would suffice.

Maple's Nutrient Cocktail

In contrast to refined sugar, primarily composed of sucrose, maple syrup contains a diverse range of more than 250 substances. These compounds either occur naturally in the maple tree or are formed during processing.

"It also contains a cocktail of other substances," Seeram said.

Maple syrup contains oligosaccharides, organic acids, amino acids, vitamins, and various minerals. It's also rich in phenolic compounds, which exhibit a range of biological activities.

There are more than 67 grams of carbohydrates in 100 grams of maple syrup. It also contains 225 milligrams of potassium; 109 milligrams of calcium; magnesium, manganese, zinc, and iron; and trace amounts of thiamin, riboflavin, and niacin.

Maple Syrup as a Superfood

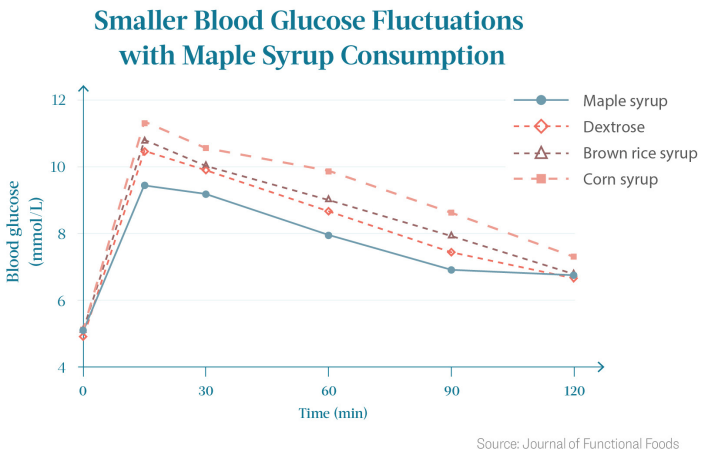
Seeram said maple syrup contains numerous substances that warrant further research and development. Its phenolic compounds exhibit a range of beneficial activities, including anti-mutagenic, anti-radical, antioxidant, anti-inflammatory, antidiabetic, and even anti-cancer properties.

Antidiabetic

Blood sugar levels rise when food is broken down and absorbed by enzymes. Inhibiting these enzymes is considered an important strategy for treating Type 2 diabetes.

Maple syrup extract is rich in phenolic compounds, including ethyl acetate and butanol, which can inhibit the enzymes responsible for breaking down starch into sugars. These compounds can also hinder the enzymes that aid in the absorption of sugars in the small intestine, slowing the rapid digestion of carbohydrates and suppressing post-meal blood sugar.

Abscisic acid (ABA) found in maple syrup is believed to have potential antidiabetic properties. This plant hormone shares structural similarities with a class ofantidiabetic drugs known as thiazolidinediones, and animal studies have demonstrated the protective effects of ABA



Compared to brown rice syrup, corn syrup, and pure dextrose, consuming maple syrup results in more minor fluctuations in blood sugar levels.

against Type 2 diabetes.

A study conducted at Laval University in Canada revealed that compared to brown rice syrup, corn syrup, and pure dextrose, consuming maple syrup resulted in more minor fluctuations in blood sugar and better responses in insulin secretion and other related indicators.

Reduces Oxidative Stress and Inflammation

Stress, physical injuries, viral infections, exposure to chemical substances, and other factors can trigger the release of toxic substances from cells, including free radicals. Oxidative stress caused by excessive free radicals has been linked to aging and various degenerative diseases, including cancer, heart disease, multiple sclerosis, Parkinson's disease, autoimmune diseases, and dementia.

Research has confirmed that phenolic compounds in maple sap and syrup exhibit antioxidant activity and can scavenge free radicals. A study published in the Journal of Medicinal Food indicated that while pure maple syrup's ability to clear free radicals is lower than that of blueberry juice, it's comparable to orange and strawberry juices. Additionally, darker varieties have more pronounced antioxidant activity due to their higher phenolic content.

Anti-Cancer and Anti-Mutagenic

Maple syrup contains various phenolic compounds, including kaempferol, luteolin, quercetin, myricetin, and catechin, which exhibit potent anti-tumor and anti-mutagenic properties.

It can inhibit the growth of various cancer cells, including prostate, lung, breast, and colorectal. It's worth noting that in experiments, maple syrup specifically targets rapidly growing cancer cells while leaving normal cells unaffected.

Maple syrup extract also protects cells and can counteract the mutagenic effects caused by toxic chemicals.

Quebecol: Unique Maple Compound

Quebecol is a unique chemical compound discovered in maple syrup in recent years, believed to possess anti-inflammatory properties. Interestingly, it isn't naturally present in maple sap and is found only in small quantities in maple syrup. "The chemical is produced during the transformation of the sap in maple syrup, which requires lots of heating and boiling and evaporation," Normand Voyer, a professor at Laval University's Department of Chemistry, told The Epoch Times. He and his colleagues have developed a method for synthesizing quebecol, and scientists worldwide are now studying the substance.

"The source of inspiration was nature," Voyer said,

noting that nature also serves as inspiration for many other drugs on the market. "Nature serves us in providing beautiful chemical structures and natural substances that are unique."

In lab studies, quebecol has shown significant potential in treating inflammatory diseases. For instance, it has been proven to positively affect conditions such as periodontitis and psoriasis.

How to Choose Maple Syrup

Before using maple syrup as a substitute for refined sugar in your diet, it's crucial to read the product labels and instructions carefully.

Some maple syrup products may actually be high-fructose corn syrup with added maple flavor, with a GI value of up to 68, much higher than that of pure maple syrup. Long-term high artificial sugar intake can lead to metabolic disorders such as insulin resistance, abdominal fat accumulation, and high blood lipids.

Look at the ingredient labels and select those that are 100 percent real maple syrup.

Additionally, when selecting maple syrup, choose darker-colored varieties, as they contain more phenolic compounds.

Despite its benefits, it's important not to eat too much maple syrup.

"First and foremost, it is indeed a sweetener. You

should not use a large amount of any sweetener," Seeram said.

"Do I believe that it is a functional sweetener or smarter sweetener [than] unrefined sugar? The answer is yes," but, he added, "you should drizzle, not guzzle."

According to the 2020–2025 Dietary Guidelines for Americans, developed by the USDA, limiting the intake of free sugars to less than 10 percent of total daily calories is recommended. For someone with a daily calorie intake of 2,000 calories, the upper limit of free sugar intake would be 200 calories. Sixty milliliters (approximately ¼ cup or 4 tablespoons) of maple syrup provides 270 calories.

The British government takes it a step further in its recommendations, suggesting that the energy from free sugars should be limited to below 5 percent. This means that for adults, the total daily intake of free sugars shouldn't exceed 30 grams, equivalent to less than 40 milliliters of maple syrup (1 tablespoon has 15 milliliters).

Coconut Sugar

"Research has confirmed that there are five main phenolic compounds, such as gallic acid, protocatechuic acid, caffeic acid, p-coumaric acid, and alanine in coconut sap. These will be in coconut sugar."

Yus Aniza Yusof, Department of Process and Food Engineering, Universiti Putra Malaysia

When it comes to healthy natural sugars, many people think of coconut sugar. Some might assume because of its name that coconut sugar is extracted from coconut fruit. However, to be precise, this type of sugar is called "coconut blossom sugar," as it's derived from sap that flows from the coconut tree's inflorescences, which are clusters of flowers

on a stem. Coconut sugar boasts numerous health benefits not widely known.

How Is Coconut Sugar Produced?

To obtain coconut sugar, coconut farmers usually climb coconut trees twice a day. During this process, they adeptly employ knives to cut into the unopened inflorescences of the coconut trees, collecting the sap that flows from them. The sap is then boiled, concentrated, and processed into sugar syrup, blocks, or granules.

The main producers of coconut sugar are Southeast Asian countries, such as the Philippines, Indonesia, and Thailand.

Coconut farmers cut open the unopened inflorescences of coconut trees, collecting the sap that flows from them. (Pisitphol/Shutterstock)

A single inflorescence from a coconut tree can yield 1.5 liters of sap each day, which contains 15 percent sugar, enough to produce 200 grams of coconut sugar. On average, a coconut tree grows a new inflorescence each month, and each can be tapped for sap for more than 40 consecutive days. This harvesting cycle of coconut trees can extend up to 20 years.

The Composition of Coconut Sugar

In general, foods with a GI of 55 or lower are classified as low-GI foods, as they result in a gradual change in blood sugar levels after consumption. Foods with a GI value between 56 and 69 are classified as medium-GI foods, and foods with a value of 70 or higher are considered high-GI foods.

Various sources indicate that the GI of coconut sugar falls between 35 and 54, similar to that of maple syrup and lower than that of honey, which has a GI value of 60. The GI of coconut sugar is lower because of its sugar composition.

Coconut sugar made from fresh coconut sap without preservatives is made up of about 49 percent sucrose, 16 percent glucose, and 14 percent fructose. However, if preservative lime is added during the sap collection process, it will break down a smaller amount of sucrose into glucose and fructose. As a result, the produced coconut sugar will contain a higher sucrose level.

Coconut sugar also contains a certain amount of inulin, approximately 4.7 grams per 100 grams. Inulin is a type of dietary fiber that can help slow the rise of blood sugar.

The Health Benefits of Coconut Sugar

Lowers Blood Pressure

The process of boiling coconut sap involves a Maillard reaction, an interaction of sugars, amino acids, and other macromolecules. The products of the Maillard reaction contribute to the nutritional value and sensory enjoyment of coconut sugar. However, the effects of the Maillard reaction are intricate and heterogeneous and can result in advanced glycation end products, which are something that should generally be avoided. But some of these substances also possess antioxidant and anti-inflammatory activities.

American scientists conducted a small-scale pilot study employing a double-blind, randomized, placebo-controlled design published in the Journal of Applied Physiology. The study demonstrated the potential cardioprotective effect of coconut sugar on middle-aged and older adults.

Nineteen adults around the age of 55 participated in the experiment. One group of participants consumed 1.5 grams of coconut sugar daily, and the other received a placebo. After eight weeks, the participants who consumed coconut sugar experienced a reduction in systolic blood pressure from 117 to 109 mmHg. The consumption of coconut sugar was associated with an improvement in arterial stiffness among participants.

Polyphenol Potential

One of the factors leading to Type 2 diabetes is oxidative stress, which can induce insulin resistance and impair insulin secretion. Coconut sugar contains high levels of polyphenols, which can reduce oxidative stress.

"Research has confirmed that there are five main phenolic compounds, such as gallic acid, protocatechuic acid, caffeic acid, p-coumaric acid, and alanine in coconut sap. These will be in coconut sugar, but the amount will definitely change (increased in this case) due to longer processing time and higher processing temperature," Yus Aniza Yusof, from the Department of Process and Food Engineering at the Faculty of Engineering, Universiti Putra Malaysia, told The Epoch Times.

Experiments have demonstrated that coconut sugar possesses a certain inhibitory effect on alpha-amylase. A study published in the International Journal of PharmTech Research in 2015 suggested that coconut sugar could be used to treat Type 2 diabetes.

Coconut sugar also contains amino acids such as leucine, arginine, and isoleucine, which may have antidiabetic properties.

In a study published in Foods in 2022, researchers fed diabetic rats cookies made from various raw materials. The results show that, compared with cookies containing added sucrose and margarine, rats that consumed corn cookies made with coconut sugar and coconut oil experienced a significant reduction in blood sugar levels and oxidative stress. Notably, their previously low hemoglobin levels and body weight also improved. After maintaining this diet for four weeks, the blood sugar indicators of the diabetic rats improved, and their overall condition became comparable to that of normal rats.

Nutrient Rich

Yusof mentioned that coconut sap contains 0.27 percent ash, which represents the content of minerals and trace metals such as calcium, magnesium, manganese, copper, sodium, potassium, zinc, and iron.

"As the minerals are more stable and don't destroy even by burning, hence they are present in coconut sugar too," she explained.

The iron, magnesium, and zinc content in coconut sugar is twice, four times, and 10 times higher than in cane sugar, respectively. Coconut sugar also contains more phosphorus and potassium.

According to Yusof, although the quantities of these substances in coconut sugar aren't substantial, consuming coconut sugar can, to some extent, provide the body with minerals and trace metals.

Coconut sugar contains the amino acids required for protein synthesis, and it's also a rich source of vitamins B1, B2, B3, and B6.

The Golden Mean of Coconut Sugar

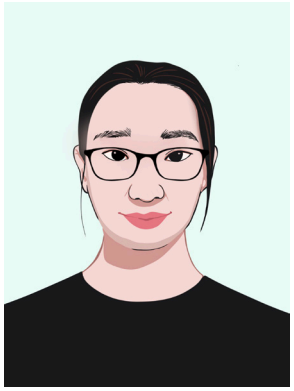
Coconut sugar contains 16 calories per teaspoon, the same as regular sugar. Although coconut sugar has some nutritional components, the quantities are relatively limited. Excessive consumption can offset the benefits because of the overall intake of sugars.

German researchers conducted a sensory evaluation of various coconut sugars, and interestingly, coconut sugar was described as having neither the aroma nor the taste of coconut.

The more affordable coconut sugars tend to have a darker color and coarser granules and are primarily characterized by their sweetness.

On the other hand, the more expensive coconut sugars tend to be light brown, have a finer texture, and exhibit higher fluidity. They were described as having a combination of sweet, caramel, malt, and roasted flavors.

Part II of this book focuses on practical approaches to reducing sugar consumption. It offers a detailed analysis of the physiological effects of sugar, its systemic impacts, and the benefits of a reduced-sugar diet. Through expert insights, scientific research, and practical tips, Part II provides readers with the tools to identify hidden sugars and adopt sustainable dietary practices. The upcoming chapters will turn theoretical knowledge into actionable strategies.



About the Author

Flora is a health writer for The Epoch Times, specializing in chronic diseases and cancer. She holds a master's degree in demography and served as editor of an influential social sciences journal for seven years. Shifting her focus from macro issues like population changes and economic development to personal health, Flora finds great joy and satisfaction in her work. She bases her articles on thorough literature reviews and in-depth interviews with experts, aiming to provide content that genuinely helps people.

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