Understanding Sugar Issues
Is it our friend or is it our foe?

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Opening

- We are hearing that sugar is bad for you and we have trouble staying away from sugar. It can be addictive.
- Sugar is everywhere in processed foods and drinks, especially in sodas.
- It is also how much sugar one is eating and drinking.
- I have good news, not all sugar is bad for you. There is something called glyconutrients. They are known as plant sugars.
- There are sugars that are good for you. It is actually a nutrient but it has to come from the right sources. Basically, it is best coming from clean and whole foods.
- One concern that all of us need to be aware of is the per capita consumption of sugar in the United States.

Overview

- What is sugar?
- Role of Glyconutrients
- Types of sugars (Glyconutrients)
- Sugar Chemistry
- Overall Picture on Carbohydrates
- Three Types of Blood Sugar Issues:
  - Hyperglycemia
  - Hypoglycemia
  - Reactive Hypoglycemia
- Other Health Issues
  - Diabetes Type II
  - Diabetes Type I
  - Non-Alcoholic Fatty Liver Disease
- Ten Reasons how sugar is harmful
- Bad sugars
- Good sugars
- Addendum (listed on the next slide)
- Conclusion

Addendum

- Advanced Glycation End Products (AGEs)
- Bibliography
- Dietary sources of Oligosaccharides
- FODMAP Diet
- Glossary
- Glycemic Index
- Insulin
- Listing of Good Sugars and Bad Sugars
- Peripheral Neuropathy
- Saccharide Definition
- Sugars that are Hidden Sugars
- Sugars that are: Sucrose, High Fructose Corn Syrup, and Agar Nectar
- Sugars that contain both Sucrose and Fructose
- Sugars with Glucose
- Sugars with Fructose only and Other Sugars
- Sugars –Fructose
- Sugars -Cravings
- Sugars –Cravings, Strategies to Reduce Cravings
- Toxic Exposure

What is Sugar?

- There are a lot of definitions when it comes to sugar. There are actually many different types of sugars. It is covered in the appendix.
- The sugar that we are most concerned about is processed sugar that has been striped of its nutrients. It is considered to be a simple carbohydrate, easily digested absorbed by the body. (Note: There are simple and complex carbohydrates.)
- Sugar as a powdered substance is used as a food and sweetening agent. It is used widely and is known as table sugar.
- There is also slang for sugar as a term of endearment, calling a pet sugar. My late mother-in-law would call our cat sugar, someone who is sweet and loving, as a term of endearment.
- The next slide will cover some of the more detailed definitions of sugar.

What is Sugar? continued

- Sugar is a sweet, crystalline substance, $C_{12}H_{22}O_{11}$, obtained chiefly from the juice of the sugar cane and the sugar beet, and present in sorghum, maple sap, etc. It is used extensively as an ingredient and flavoring of certain foods and as a fermenting agent in the manufacture of certain alcoholic beverages. (Note: Alcoholic beverages do contain sugar.)
- Sugar is a member of the same class of carbohydrates, as lactose, glucose, or fructose.
- Sugar can be considered to be in any class of sweet, soluble, crystalline carbohydrates, as the monosaccharides and disaccharides. There is a group called polysaccharides, which is multiple disaccharides and found in foods that are considered starch.
- One type of sugar is sucrose. It is a crystalline sugar found in many plants, besides sugar cane, sugar beets, and sugar maple. Sucrose is a disaccharide composed of fructose and glucose.
- Sugar is in alcoholic beverages, as well.

Source: https://www.dictionary.com/browse/sugar

https://www.yourdictionary.com/sugar

Glyconutrients

- Glyconutrients are known as plant sugars, found in whole foods. It is a new area of nutritional science. There are over 200 (saccharides) sugars.
- Glyconutrients plays various roles in the body.

Role of Glyconutrients

- Glyconutrients assist on how our cells form the structure of our body.
- Glyconutrients assist with daily repair of tissues and healing.
- Glyconutrients helps the immune system to determine what belongs to the body and what is foreign to the body.
- Glyconutrients are:
  - anti-bacterial
  - anti-parasitic
  - anti-tumor (can be used in conjunction with standard cancer treatment)
  - anti-viral
- Glyconutrients serve as building blocks for the manufacture of large molecules made of sugars in combination with proteins (glycoproteins) or fats (glycolipids).
- Glyconutrients can also help the brain and the nervous system, bone density, and muscle mass.

Source: Sugars that heal: the new healing science of glyconutrients (2001) by Emil I. Mondoa, MD and Mindy Kitei. (Publisher: Ballantine Books)

Types of Sugar (Glyconutrients) (one of three)

While there are over 200 glyconutrients, out of this number, eight are essential. They are:

- Fucose: Fucose helps the brain's long term memories, inhibit tumor growth, and guards against respiratory infections.
- Galactose: Galactose inhibits tumor growth, helps with wound healing, and decreases inflammation.
- Glucose: Glucose enhances memory, stimulates calcium absorption, enhances cellular communication. Too much glucose raises insulin levels, and causes disturbances in depression, maniac-depression, Alzheimer's, and eating disorders.

Source: Miracle sugars: the gluconutrient link to disease prevention and improved health (2003) by Rita Elkins, M.H. (Publisher: Woodland Publishing)

Types of Sugar (Glyconutrients) continued (two of three)

Glyconutrients continued:

•Mannose: Mannose facilitates cellular communication, inhibits tumor growth, prevents infections, and eases inflammation. It can lower blood sugar and triglycerides levels in diabetics.

•N-Acetylgalactosamine: N-Acetylgalactosamine inhibits the spread of tumors and enhances cellular communication. Levels have been found to be low in people with heart disease.

•N-Acetylglucosamine: N-Acetylglucosamine helps repair cartilage, decrease pain and inflammation, and improves range of motion. Deficiencies and defects are found in those with Crohn's, ulcerative colitis, and interstitial cystitis.

Source: Miracle sugars: the gluconutrient link to disease prevention and improved health (2003) by Rita Elkins, M.H. (Publisher: Woodland Publishing)

(Glyconutrients) continued (three of three)

Types of Sugar:

- N-Acetylneuraminic: N-Acetylneuraminic facilitates brain development, learning, memory, performance, lowering LDL cholesterol levels, and mucous viscosity.
- Xylose: Xylose is anti-bacterial, anti-fungal, and helps with cellular communication and colitis

Source: Miracle sugars: the gluconutrient link to disease prevention and improved health (2003) by Rita Elkins, M.H. (Publisher: Woodland Publishing)

Sugar Chemistry –Molecular Structure of Various Types of Sugars

- Monosaccharide -mono means one molecule, saccharide means sugar
- Disaccharide -di means two molecules, saccharide means sugar, and two saccharides linked together (They are glyconutrients.)
- Oligosaccharides -means three to six monosaccharides
- Polysaccharides -means hundreds and thousands of saccharides

Note #1: Source: Sugars that heal: the new healing science of glyconutrients (2001) by Emil I. Mondoa, MD and Mindy Kitei. (Publisher: Ballantine Books)

Note #2: Dietary sources and their benefit for Oligosaccharides is in the appendix.

Overall Picture on Carbohydrates

- A number of issues are listed with carbohydrates. One, what matters in eating a carb is to be aware of their nutritional content.
- Two, it helps to be aware at the rate the sugar from the carbohydrate is absorbed in the body. A slow sugar release is better than a fast release that can cause the blood sugar to rise rapidly or spike.
- Three, plain sugar is known to be a factor in a number of diseases.
- Four, there are different types of sugars. They are:
  - Monosaccharides (glucose, fructose, and galactose)
  - Disaccharides (sucrose and lactose)
  - Polysaccharides (long chains of glucose molecules attached to each other, vary in length from short chain carbs to fibrous ones such as fiber)
- Five, refined carbohydrates causes three types of problems. They are:
  - Processing removes fiber in refined carbohydrates
  - Causes overconsumption of calories, leading to obesity and type 2 diabetes
  - Removes protein which is needed to neutralize hydrochloric acid in the stomach

- Source: Orthomolecular Medicine for Everyone: Megavitamin Therapeutics for Families and Physicians (2008) by Abram Hoffer, MD, PhD Andrew Saul, PhD. (Publisher: Basic Health Publication)

Three Types of Blood Sugar Issues: Hyperglycemia

Information

- Hyperglycemia is high levels of blood sugar. It is when your blood sugar is above 108.
- The pancreas steps in when the blood sugar is too high.
- Insulin converts glucose into glycogen, which is stored as glycogen into the liver.
- When the reserves in the liver can no longer absorb the excess sugar, the excess sugar or glucose becomes stored as fat.
- Over time, this can cause the pancreas to become exhausted and result in type 2 diabetes.

Symptoms

- brain fog
- eyesight issues
- frequent urination
- more thirsty

Note: There are other symptoms listed.

Source: Good Sugar, Bad Sugar: How to Power Your Body with Healthy Energy (2017/2020) by Christopher Vasey, ND. (Publisher: Traditional Arts Press)

Three Types of Blood Sugar Issues: Hypoglycemia

Information

- Hypoglycemia is low levels of blood sugar.
- It is when your blood sugar is below 72.
- When the blood sugar is too low, the pancreas releases glucagon, the adrenals release adrenaline, and the thyroid releases thyroxine to extract glycogen from the liver and the fat cells.

Symptoms

- Symptoms include: cravings for sweet food
- great fatigue, lack of energy, and weakness
- mental confusion
- palpitations, perspiration, trembling, vertigo, and even loss of consciousness

Note: There are other symptoms.

Source: Good Sugar, Bad Sugar: How to Power Your Body with Healthy Energy (2017/2020) by Christopher Vasey, ND. (Publisher: Traditional Arts Press)

Three Types of Blood Sugar Issues: Reactive Hypoglycemia

Information

- Excess insulin can cause the blood sugar to drop to harmful levels.
- Problems can occur when the liver and the adrenals are not working properly on regulating the blood sugar.
- A major cause is the consumption of bad sugars. The good sugars are less harmful on the body.
- Low blood sugar in the brain do result in a number of health issues. Some of them include anxiety attacks and phobias, and even anti-social behavior.

Symptoms

- eat a lot
- fatigue
- lack of energy
- mental disorders
- Note: People vary in their ability to tolerate sugar. Those with low tolerance to sugar are more likely to experience reactive hypoglycemia.

Source: Good Sugar, Bad Sugar: How to Power Your Body with Healthy Energy (2017/2020) by Christopher Vasey, ND. (Publisher: Traditional Arts Press)

Other Health Issues: Diabetes Type 2

- When the blood is full of sugar, the tiny blood vessels get plugged up with oxidized glucose.
- Excessive sugar impairs nitric oxide. It is a natural chemical that relaxes the walls of your blood vessels. As the eyes and kidneys have very small blood vessels, they are at risk for being damaged by high blood sugar and low nitric oxide.
- Insulin's job is to ferry glucose from the blood stream into muscle, fat, and liver cells.
- When the cells are constantly exposed to high levels of insulin, our cells adapt by reducing the number receptors on their surfaces to respond to insulin. These receptors become desensitized and develop insulin resistance.
- Higher levels of insulin become necessary for the sugar to enter the cells. Eventually, diabetes type 2 develops. People with diabetes have high blood sugar levels because their body cannot transport sugar into cells.

Source: Sugar Crush: how to reduce inflammation, reverse nerve damage, and reclaim good health (2015) by Dr. Richard Jacoby and Raquel Baldelomar. (Publisher: Harper Collins Crown Publishers) and
Grain Brain: The Surprising Truth About Wheat, Carbs, and Sugar, Your Brain's Silent Killers (2013) by David Perlmutter, MD. (Publisher: Little, Brown, and Company)

Other Health Issues: Diabetes Type 2 continued

- Higher levels of insulin become necessary for the sugar to enter the cells. Eventually, diabetes type 2 develops. People with diabetes have high blood sugar levels because their body cannot transport sugar into cells.
- According to Dr. Joseph Pizzorno, ND, our exposure to toxins can also play a role in the development of diabetes type 2. There are diabetics who are not overweight. (Note: This is covered in more detail in the appendix.)
- While we are on this subject, some of our pets are developing diabetes and it raises questions as to what is in processed dog and cat food.

Source: Sugar Crush: how to reduce inflammation, reverse nerve damage, and reclaim good health (2015) by Dr. Richard Jacoby and Raquel Baldelomar. (Publisher: Harper Collins Crown Publishers) and
Grain Brain: The Surprising Truth About Wheat, Carbs, and Sugar, Your Brain's Silent Killers (2013) by David Perlmutter, MD. (Publisher: Little, Brown, and Company)

Other Health Issues: Diabetes Type 2 continued

A number of complications occur with Diabetes Type 2. They are:

- Blindness
- Heart attacks
- Kidney failure
- Painful neuropathy
- Slow healing wounds

Source: Holistic Keto for Gut Health (2020) by Kristin Grayce McGary. (Publisher: Findhorn Press)

Other Health Issues: Diabetes Type 1

- Type 1 diabetes(T1D), also known as juvenile diabetes, is a form of diabetes in which very little or no insulin is produced by the pancreas.
- Insulin is a hormone required for the body to use blood sugar.
- Before treatment this results in high blood sugar levels in the body.
- The classic symptoms are frequent urination, increased thirst, increased hunger, and weight loss. Additional symptoms may include blurry vision, tiredness, and poor wound healing. Symptoms typically develop over a short period of time.

Source: Wikipedia: Type 1 diabetes

Non-Alcoholic Fatty Liver Disease

- Non-alcoholic fatty liver disease(NAFLD) is excessive fat build-up in the liver with insulin resistance due to causes other than alcohol use. There are two types; non-alcoholic fatty liver(NAFL) and non-alcoholic steatohepatitis (NASH), with the latter also including liver inflammation.
- The Mayo Clinic explains that the prevalence of NAFLD is increasing around the world, particularly in Western nations like the U.S. In fact, here at home it is the most common form of chronic liver disease, affecting up to 100-million people, according to the source.

Non-Alcoholic Fatty Liver Disease continued

Causes:

- The main reason behind non-alcoholic fatty liver disease is excessive levels of insulin.
- There is limited understanding of why some fatty livers develop inflammation that progresses to cirrhosis. NAFLD and NASH are both linked to the following:

•Overweight or obesity

  •Insulin resistance, in which your cells don't take up sugar in response to the hormone insulin

  •High blood sugar (hyperglycemia), indicating prediabetes or type 2 diabetes

  •High levels of fats, particularly triglycerides, in the blood

- These combined health problems appear to promote the deposit of fat in the liver. For some people, this excess fat acts as a toxin to liver cells, causing liver inflammation and NASH, which may lead to a buildup of scar tissue in the liver.

Source: https://www.mayoclinic.org/diseases-conditions/nonalcoholic-fatty-liver-disease/symptoms-causes/syc-20354567

And https://anh-usa.org/the-great-diabetes-lie/

Note: Another type of diabetes is gestational diabetes, which occurs doing pregnancy.

Non-Alcoholic Fatty Liver Disease continued

- A **post** on ScienceDirect.com explains there is growing evidence of a connection between NAFLD and metabolic syndrome, the latter which is a “disease composed of different risk factors such as obesity, type 2 diabetes or dyslipidemia.” NAFLD is being recognized as the “liver manifestation” of the syndrome.
- The prevalence of metabolic syndrome is rising as global obesity levels rise. A key characteristic linking the liver disease and metabolic syndrome is resistance to the hormone that regulate glucose in the blood, which can lead to high blood sugar and is associated with accumulation of fat in areas such as the liver. The resulting inflammation can further aggravate the resistance, creating a “vicious cycle.” source.

Source: https://www.activebeat.com/your-health/6-facts-about-non-alcoholic-fatty-liver-disease/6/

Ten Reasons How Sugar is Harmful

1. Immune suppression
   Neutrophils (5 hours)
2. Contributes to Fatty Liver Disease (especially fructose)
3. Accelerates aging process (AGEs)
4. Can cause memory issues (can cause dementia)
5. Oral inflammation (inflammation of gums, cavities, etc.)
6. Vitamin and mineral deficiencies
7. Sugar increases risk for cancer
8. Sugar increases risk for Type II Diabetes
9. Sugar increases risk for cardiovascular disease (both heart and blood vessels, high blood pressure, and triglycerides)
10. Increase fat cells and weight/obesity

- Source: Dr. Peter Osborne, YouTube

Bad Sugars (Common ones)

- Cane sugar or juice
- Caramel
- Dextrose
- High-fructose corn syrup
- Invert sugar
- Maltose
- Molasses
- Rice syrup
- White sugar (also known as table sugar)

Source: https://www.healthline.com/nutrition/14-ways-to-eat-less-sugar

Note: There are other sugars and it is covered in the appendix.

Good Sugars

- Natural sugars are the ones found in whole, unprocessed foods —the fructose in bananas or berries, or lactose in a glass of skim milk
- Good Sugar Vs. Bad Sugar. There are two types of sugar-added sugar, which includes the familiar white granulated “table sugar” (sucrose), as well as concentrated sources like fruit juice, and then there are naturally occurring sugars found in fruit, vegetables, full fat dairy, honey and unrefined carbohydrates.

Addendum

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- Advanced Glycation End Products (AGEs)
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- Dietary sources of Oligosaccharides
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Addendum: Advanced Glycation End Product (AGEs)

- AGEs -Advanced Glycation End Product - AGEs are a toxic form of scar tissue.
- Advanced glycation end products (AGEs) causes protein fibers to become misshapen and inflexible.
- Glucose reacts with proteins, fats, and nucleic acids. It can keep the nerves from functioning properly and cause lesions.
- These type of proteins can cause neurological disorders by being less functional, attach themselves to other damaged proteins, and increase free radicals.
- A high carbohydrate diet especially fructose results in a high glycation process. The best way to minimize AGEs is to reduce sugar intake.

Below is a list of what high glycation can cause:

- Aging
- Alzheimer's
- Arthritis
- Atherosclerosis
- Cataracts
- Cognitive decline
- Damaged blood vessels
- Diabetes and Complications
- Heart disease and failure
- Kidney Disease
- Memory loss
- Peripheral neuropathy
- Wrinkled skin and premature aging skin

Addendum: Advanced Glycation End Product (AGEs) continued

- Glycation is a chemical reaction in which the molecules of sugar and protein are tangled up, resulting in deformed and non-functioning molecules.
- Glycated proteins have a tendency to fuse together, a process known as cross-linking.
- This causes the body's tissues to become increasingly stiff and tough. Glycated proteins produce cellular toxins known as advanced glycation end products or AGEs.
- Excess sugar gets attached to proteins and they result in advanced glycation end products.

Sources: Grain Brain: The Surprising Truth About Wheat, Carbs, and Sugar, Your Brain's Silent Killers (2013) by David Perlmutter, MD. (Publisher: Little, Brown, and Company)

Sugar Crush: how to reduce inflammation, reverse nerve damage, and reclaim good health (2015) by Dr. Richard Jacoby and Raquel Baldelomar. (Publisher: Harper CollinsCrownPublishers)

The Life Extension Revolution: the new science of growing older without aging (2005) by Philip Lee Miller, MD with Monica Reinagel. (Publisher: Bantam)

Addendum: Bibliography (one of four)

- Good Sugar, Bad Sugar: How to Power Your Body with Healthy Energy (2017/2020) by Christopher Vasey, ND. (Publisher: Traditional Arts Press)
- Grain Brain: The Surprising Truth About Wheat, Carbs, and Sugar, Your Brain's Silent Killers (2013) by David Perlmutter, MD. (Publisher: Little, Brown, and Company)
- Healthy Gut, Flat Stomach: the fast and easy low FODMAP Diet plan (2017) by Danielle Capalino. (Publisher: The Countryman Press)
- Holistic Keto for Gut Health (2020) by Kristin Grayce McGary. (Publisher: Findhorn Press)

Addendum: Bibliography continued (two of four)

- https://anh-usa.org/the-great-diabetes-lie/
- https://en.wikipedia.org/wiki/Glycemic_index
- https://en.wikipedia.org/wiki/Insulin
- https://www.activebeat.com/your-health/6-facts-about-non-alcoholic-fatty-liver-disease/6/
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- •https://www.healthline.com/nutrition/14-ways-to-eat-less-sugar

Addendum: Bibliography continued (three of four)

- https://www.healthline.com/nutrition/56-different-names-for-sugar
- https://www.mayoclinic.org/diseases-conditions/nonalcoholic-fatty-liver-disease/symptoms-causes/syc-20354567
- https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3086960/(Title: Diagnosis and Treatment of Pain in Small Fiber Neuropathy and authors: Alexandra Hovagimian and Christopher H. Gibbons)
- https://www.news-medical.net/health/Insulins-role-in-the-human-body.aspx

https://www.webmd.com/diabetes/peripheral-neuropathy-risk-factors-symptoms#1

- https://www.youtube.com/watch?v=NW3bhm0Rcgs&feature=em-uploademail(web video by Dr. Peter Osborne, title: Sugar is terrible for you -here are 10 reasons why!)
- www.mayoclinic.org › symptoms-causes › syc-20352061

Addendum: Bibliography continued (four of four)

- The IBS Elimination Diet and Cookbook (2017) by Patsy Catsos, MS, RD, LD. (Publisher: Harmony Books)
- The Life Extension Revolution: the new science of growing older without aging (2005) by Philip Lee Miller, MD with Monica Reinagel. (Publisher: Bantam**)**
- The Microbiome Diet: the scientifically proven way to restore your gut health and achieve permanent weight loss (2014) by Raphael Kellman, MD. (Publisher: Da Capo Lifelong Books)
- Orthomolecular Medicine for Everyone: Megavitamin Therapeutics for Families and Physicians (2008) by Abram Hoffer, MD, PhD Andrew Saul, PhD. (Publisher: Basic Health Publication)
- Sugar Crush: how to reduce inflammation, reverse nerve damage, and reclaim good health (2015) by Dr. Richard Jacoby and Raquel Baldelomar. (Publisher: Harper Collins Crown Publishers)
- Sugars that heal: the new healing science of glyconutrients (2001) by Emil I. Mondoa, MD and Mindy Kitei. (Publisher: Ballantine Books)

Addendum: Dietary sources of Oligosaccharides

- A specific type of sugar or starch is called oligosaccharides (contain soluble plant fibers, a type of prebiotic, and promotes healthy bacteria, and begins to override the bad bacteria) and are found in the following foods:
  - asparagus
  - garlic
  - Jerusalem artichoke
  - jicama
  - leeks
  - onion

Source: The Microbiome Diet: the scientifically proven way to restore your gut health and achieve permanent weight loss (2014) by Raphael Kellman, MD. (Publisher: Da Capo Lifelong Books)

Addendum: FODMAP Diet

- FODMAP stands for Fermentable Oligosaccharides, Disaccharides, Monosaccharides, and Polyols, which are short chain carbohydrates and sugar alcohols that are poorly absorbed by the body.
- Some people may be sensitive to these substances.
- The FODMAP protocol is a three step process.
  - •Phase one is the elimination diet (2 weeks), eliminating the high FODMAP foods
  - •Phase two is the testing
  - •Phase three is the personalization

- An alternative elimination diet that focuses on specific sugars is:
  - •Week one -avoid lactose
  - •Week two -avoid excess fructose
  - •Week three -avoid fructans
  - •Week four -avoid galacto-oligosaccharides (GOS)
  - •Week five -avoid polyols

Two resources covering the FODMAP diet. Danielle Capalino and Patsy Catso cover in detail what the FODMAP diet protocol along with recipes. See bibliography for full citation. Next two slides provide more details about FODMAP.

Table of Fodmap Sugars, part one of two

Type of Sugar	High Levels	High Levels	Low Levels
Oligosaccharides:	Barley	Oolong Tea	Less than 1/4 cup of canned chickpeas
GOS and Fructans	Beans	Pistachios	Less than 1/2 cup of canned lentils
	Chamomile Tea	Plums	Green part of leeks and scallions
	Cashews	Prunes	Garlic-infused oil
	Dates	Rye	
	Dried Figs	Shallots	
	Garlic	Soybeans	
	Fennel Tea	Watermelon	
	Inulin (Chicory Root)	Wheat	
	Nectarines	White Peaches	
	Onions		
Disaccharides: Lactose	Cottage Cheese	Milk	Butter
	Cream Cheese	Ricotta	Cheddar Cheese
	Ice Cream	Yogurt	Feta Cheese
			Lactose Free Milk
			Lactose Free Yogurt
			Parmesan
			Swiss Cheese

Table of Fodmap Sugars, part two of two

Type of Sugar	High Levels	High Levels	Low Levels
Monosaccharides: Fructose	Agave Nectar	Honey	Bananas
	Apples	Jerusalem Artichokes (aka sunchodes)	Blueberries
	Cherries	Mangoes	Coconut
	Fava Beans	Pears	Lemons
	Fresh Figs	Sugar Snap Peas	Limes
	High Fructose Corn Syrup	Watermelon	Oranges
			Pineapple
			Raspberries
			Strawberries
Polyols: Sorbitol and Mannitol	Apples	Pears	Blueberries
	Apricots	Plums	Dried Cranberries (small amounts)
	Blackberries	Prunes	Green beans
	Cauliflower	Snow Peas	Strawberries
	Mushrooms	Sweet Corn	Stevia
	Peaches	Watermelon	Table Sugar

Addendum: Glossary (page one of three)

- AGEs –Advanced Glycation End product, it is covered in separate slides.
- Anabolism - It is the set of metabolic pathways that construct molecules from smaller units
- Catabolism - Catabolism is the set of metabolic pathways that breaks down molecules into smaller units that are either oxidized to release energy or used in other anabolic reactions. Catabolism breaks down large molecules into smaller units.
- Disaccharides –A double sugar molecules, A disaccharide(also called a double sugar or *bivose*) is the sugar formed when two monosaccharides (simple sugars) are joined by glycosidic linkage. Like monosaccharides, disaccharides are soluble in water. Three common examples are sucrose, lactose, and maltose.
- FODMAP Diet -FODMAP stands for Fermentable Oligosaccharides, Disaccharides, Monosaccharides, and Polyols, which are short chain carbohydrates and sugar alcohols that are poorly absorbed by the body, resulting in abdominal pain and bloating.
- Fructose –Is a type of sugar that is processed through the liver.
- Glycemic Index and Glycemic Load –Measures the rise of the blood sugar after eating specific food in a specific.

Addendum: Glossary continued (page two of three)

•Glycogen -A substance deposited in bodily tissues as a store of carbohydrates. It is a polysaccharide which forms glucose on hydrolysis. The body breaks down most carbohydrates from the foods we eat and converts them to a type of sugar called glucose. When the body doesn't need to use the glucose for energy, it stores it in the liver and muscles. This stored form of glucose is made up of many connected glucose molecules and is called glycogen.

•Glyconutrients –Glyconutrients are a group of sugars extracted from plants and thought to be essential for the body by helping cell-to-cell communication. As plant sugars, they are found in a variety of plants in nature, including trees, seaweed, fungus, mushrooms, and herbs.

•Heterosaccharide. Noun. (plural heterosaccharides) (biochemistry) Any saccharide composed of more than one simple sugar.

•Hidden Sugars –Sugars that are added in processed foods under a variety of names.

•High Fructose Corn Syrup -High-fructose corn syrup(HFCS), also known as glucose-fructose, is glucose and glucose-fructose syrup, is a sweetener made from cornstarch. As in the production of conventional corn syrup, the starch is broken down into glucose by enzymes.

Note: A number of these definitions come from Wikipedia, an online encyclopedia.

Addendum: Glossary continued (page three of three)

•Insulin -Insulin is a anabolic hormone. It stimulates growth, promotes fat formation and retention, and encourages inflammation. High levels of insulin affects other hormones.

•Monosaccharides –A single sugar molecule, Monosaccharides (from Greek monos (single) and sacchar (sugar). It is also called simple sugar, are the simplest form of sugar and the most basic units of carbohydrates.

•Oligosaccharides-An oligosaccharide (/ˌɑlɪgoʊˈsækəˌɹaɪd/; from the Greekὀλίγος*olígos*, "a few", and σάκχαρ*sácchar*, "sugar") is a saccharide polymer containing a small number (typically three to ten) of monosaccharides (simple sugars).

•Polysaccharides(/ˌpɒliˈsækəraɪd/) are long chains of carbohydrate molecules, specifically polymeric carbohydrates composed of monosaccharide units bound together by glycosidic linkages. As a rule of thumb, polysaccharides contain more than ten monosaccharide units, whereas oligosaccharides contain three to ten monosaccharide units.

•SCD –Specific Carbohydrate Diet –A diet for individuals suffering from intestinal disorders like celiac disease, chronic diarrhea, Crohn's disease, colitis, cystic fibrosis, and ulcerative colitis. It has also been found to help a number of children with autism, many of whom suffer from digestive disorders. What the author is explaining that for certain individuals, the intestines are unable to digest certain sugars. The diet is designed to maximally nourish the individual and minimally nourish the intestinal microbes. This diet eliminates the sugars that facilitate fermentation and bacterial overgrowth and allows the foods and sugars that minimizes the stress (and fermentation) of the digestive process within the intestines. Some children with autism have been found to benefit from this type of diet.

Addendum: Glycemic Index

•The glycemic index(GI) (/glaɪˈsiːmɪk/;[1]) is a number from 0 to 100 assigned to a food, with pure glucose arbitrarily given the value of 100, which represents the relative rise in the blood glucose level two hours after consuming that food. The GI of a specific food depends primarily on the quantity and type of carbohydrate it contains; but also is affected by the amount of entrapment of the carbohydrate molecules within the food, the fat and protein content of the food, the amount of organic acids (or their salts) in the food, and whether it is cooked and if so how it is cooked. GI tables are available that list many types of foods with their GIs. A food is considered to have a *low GI* if it is 55 or less; *high GI* if 70 or more; and *mid-range GI* if 56 to 69.

•The term was introduced in 1981. It is useful for quantifying the relative rapidity with which the body breaks down carbohydrates. It takes into account only the available carbohydrate (total carbohydrate minus fiber in a food).

•Glycemic index does not predict an individual's glycemic response to a food, but can be used as a tool to assess the insulin response burden of a food, averaged across a studied population. Individual responses vary greatly.

•The glycemic index is usually applied in the context of the quantity of the food and the amount of carbohydrate in the food that is actually consumed. A related measure, the glycemic load (GL), factors this in by multiplying the glycemic index of the food in question by the carbohydrate content of the actual serving.

Source: https://en.wikipedia.org/wiki/Glycemic_index

Addendum: Insulin

- Insulin(from Latin*insula*, island) is a peptide hormone produced by beta cells of the pancreatic islets; it is considered to be the main anabolic hormone of the body.
- It regulates the metabolism of carbohydrates, fats, and protein by promoting the absorption of carbohydrates, especially glucose from the blood into liver, fat, and into skeletal muscle cells.
- In these tissues the absorbed glucose is converted into either glycogen via glycogenesis or fats (triglycerides) via lipogenesis, or, in the case of the liver, into both. Glucose production and secretion by the liver is strongly inhibited by high concentrations of insulin in the blood.
- Circulating insulin also affects the synthesis of proteins in a wide variety of tissues. It is therefore an anabolic hormone, promoting the conversion of small molecules in the blood into large molecules inside the cells. Low insulin levels in the blood have the opposite effect by promoting widespread catabolism, especially of reserve body fat.

Source: https://en.wikipedia.org/wiki/Insulin

Addendum: Insulin continued

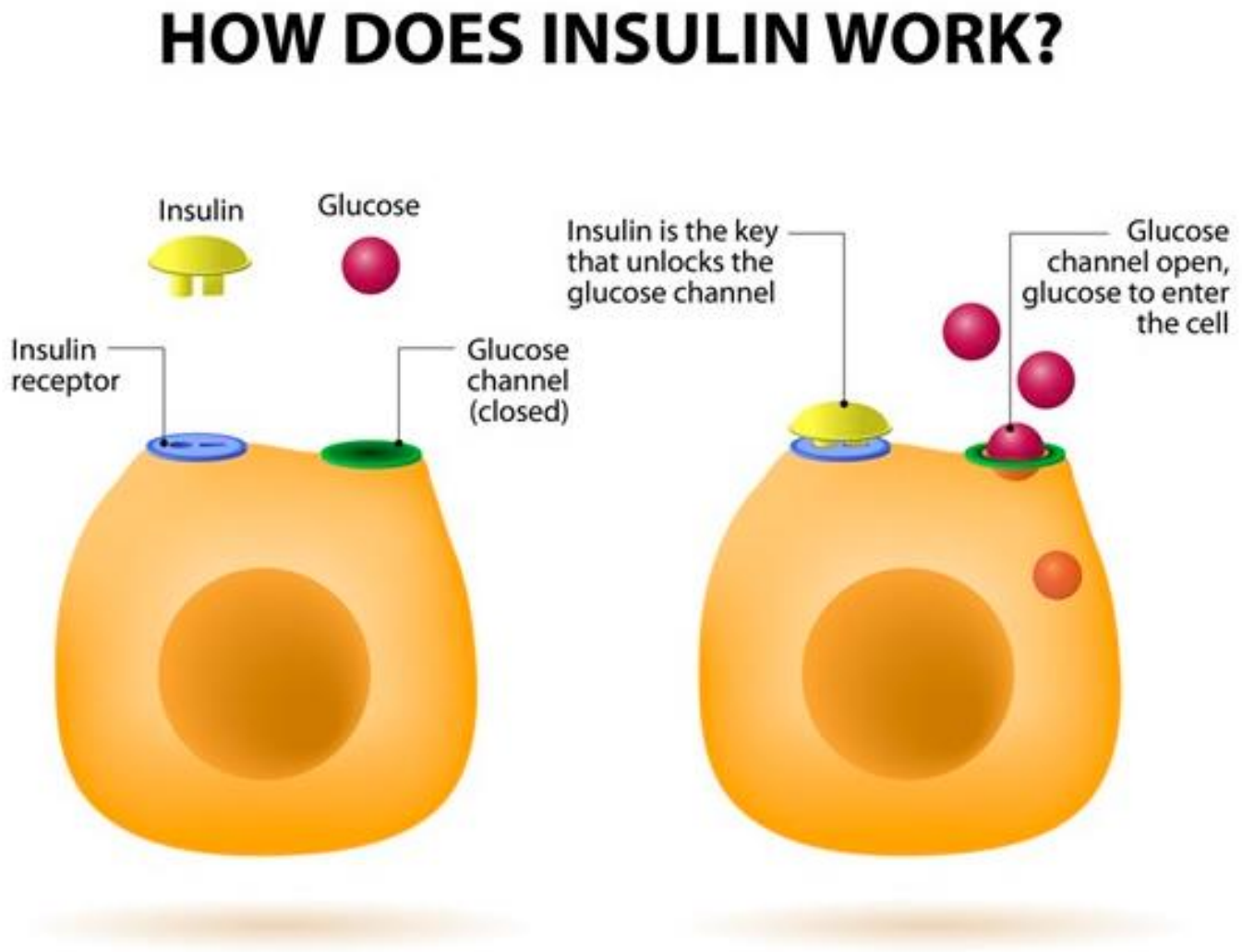

Image Copyright: Designua, Image ID: 283557914 via Shutterstock.com

Source: https://www.news-medical.net/health/Insulins-role-in-the-human-body.aspx

Addendum: Insulin continued, Role of Insulin

- **Modify the activity of enzymes** and the resulting reactions in the body.
- **Build muscle following sickness or injury** via the transportation of amino acids to the muscle tissue, which is required to repair muscular damage and increase size and strength. It helps to regulate the uptake of amino acids, DNA replication and the synthesis of proteins.
- **Manage synthesis of lipids** by uptake into fat cells, which are converted to triglycerides.
- **Manage breakdown or protein and lipids** due to changes in fat cells.
- **Uptake of amino acids and potassium** into the cells that cannot take place in the absence of insulin.
- **Manage excretion of sodium** and fluid volume in the urine.
- **Enhance learning and memory** of the brain functions.

Source: https://www.news-medical.net/health/Insulins-role-in-the-human-body.aspx

Addendum: Listing of Good Sugars and Bad Sugars (Sugar)

Bad Sugars

- Brown sugar (light, golden brown, dark)
- Confectioner's sugar
- Corn syrup
- Dextrose
- Fructose
- Granulated white table sugar
- Glucose syrup
- High-fructose corn syrup
- Invert sugar
- Liquid sugar
- Plantation sugar
- Raw sugar (organic sugar)
- Rock candy
- Sugar in large crystals
- Table molasses
- Turbinado sugar
- Xylitol (Birch syrup)

Good Sugars

- Agave syrup
- Barley malt syrup
- Blackstrap molasses
- Brown rice syrup
- Coconut syrup
- Date syrup
- Honey
- Maple syrup
- Pear concentrate
- Stevia

Source: Good sugars, Bad Sugars by Dr. Vasey, ND

Note #1: Avoid artificial sweeteners. A number of them are banned in a number of countries.

Addendum: Listing of Good Sugars and Bad Sugars (Flour)

Bad Flours	Good Flours
All-purpose white flour	Almond flour
Cake flour	Brown rice flour
White rice flour	Coconut flour
White rye flour	Sprouted wheat flour
	White whole wheat flour
	Whole corn flour (non-GMO)
	Whole meal flour (Brown, Irish style)
	Whole oat flour
	Whole rye flour
	Whole wheat flour
	Note: If gluten sensitive, avoid the grain flours.

Source: Source: Good sugars, Bad Sugars by Dr. Vasey, ND

Note #1: Flour can itself raise the blood sugar.

Addendum: Peripheral Neuropathy

- Diabetic peripheral neuropathy prognosis
- Peripheral neuropathy is nerve damage caused by chronically high blood sugar and diabetes. It leads to numbness, loss of sensation, and sometimes pain in your feet, legs, or hands. ... About 60% to 70% of all people with diabetes will eventually develop peripheral neuropathy, although not all suffer pain. (Source: https://www.webmd.com/diabetes/peripheral-neuropathy-risk-factors-symptoms#1)
- Small fiber peripheral neuropathy prognosis
- Treatment of any underlying causative etiology of a small fiber neuropathy is likely to be the most effective treatment of pain, when possible. Many cases of small fiber neuropathy will remain idiopathic, or will still require treatment of pain. (Source: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3086960/)

Addendum: Peripheral Neuropathy continued

- Idiopathic peripheral neuropathy prognosis
- Idiopathic Neuropathy. ... Doctors call this disorder “idiopathic”, which means “of unknown cause.” Typically, idiopathic peripheral neuropathy occurs in people over 60 years old; progresses slowly (or doesn't progress at all after the initial onset); and it can be very disruptive to someone's normal life and lifestyle.
- (Source: https://www.foundationforpn.org/what-is-peripheral-neuropathy/causes/idiopathic-neuropathy/)
- Severe peripheral neuropathy prognosis
- Signs and symptoms of peripheral neuropathy might include:
- Gradual onset of numbness, prickling or tingling in your feet or hands, which can spread upward into your legs and arms.
- Sharp, jabbing, throbbing, freezing or burning pain.
- Extreme sensitivity to touch.
- Lack of coordination and falling.
- (Source: www.mayoclinic.org › symptoms-causes › syc-20352061)

Addendum: Saccharide Definition

- The term *saccharide* refers to the unit structure of carbohydrates. Carbohydrates are simple organic compounds that are aldehydes or ketones with many hydroxyl groups added usually on each carbon atom not part of the aldehyde or ketone functional group. The general chemical formula of carbohydrates is Cn(H2O)n. Not all carbohydrates follow this formula and are slightly different in structure from this rule.
- They are an essential structural component of living cells. They are an important source of energy for animals.
- They may be classified according to the number of monomeric units that comprise them: monosaccharides, disaccharides, oligosaccharides, and polysaccharides.
- Monosaccharides are the most fundamental type is the sugars (mono means one). They are glucose, galactose, and fructose. These simple sugars can combine with each other to form more complex types. The combination of two simple sugars is called a disaccharide whereas those consisting of two to ten simple sugars are called oligosaccharides, and those with a larger number are called polysaccharides.

Source: https://www.biology-online.org/dictionary/Saccharide

Addendum: Sugars that are Hidden Sugars

- Don’t be fooled just because you stay away from sweets.
- Added sugars hide in a number of foods, like processed frozen foods, baby food, dried fruit, cereal, granola, instant oatmeal, salad dressings, ketchup, barbecue sauces, pasta sauces, flavored yogurt, protein bars, and more.
- Sugar goes by a lot of different names —more than 60, if we’re talking about what’s listed on nutrition labels. Here are a few to look out for: brown sugar, corn sweetener, corn syrup, rice syrup, dextrose, maltose, barley malt, fructose sweetener, fruit juice concentrates, glucose, high-fructose corn syrup, honey, invert sugar, lactose, maltose, malt syrup, maple syrup, molasses, pancake syrup, raw sugar, sucrose, trehalose, and turbinado sugar.
- To identify an added sugar, be suspect of words that end with an “-ose,” as well as phrases that contain “syrup” or “malt.”
- Remember, ingredients on a packaged food are listed in descending order in terms of weight, so when you see these names at the top of the ingredients list, the product contains a lot of sugar.

Note: The addendum cover the various types of sugar in more detail, in the next four slides.

Addendum: Sugars that are: Sucrose, High Fructose Corn Syrup, and Agar Nectar

- **Sucrose/Sugar**

•Sucrose is the most common type of sugar. Often called "table sugar," it is a naturally occurring carbohydrate found in many fruits and plants.

•Table sugar is usually extracted from sugar cane or sugar beets. It consists of 50% glucose and 50% fructose, bound together.

•Sucrose is found in many processed foods, including ice cream, candy, pastries, cookies, soda, fruit juices, canned fruit, processed meat, breakfast cereals and ketchup, to name a few.

Source: https://www.healthline.com/nutrition/56-different-names-for-sugar

- **High Fructose Corn Syrup and Agar Nectar**

•**HFCS 55:**This is the most common type of HFCS. It contains 55% fructose and 45% glucose, which makes it similar to sucrose in composition.

•**HFCS 90:**This form contains 90% fructose.

•High-fructose corn syrup is found in many foods, especially in the US. These include soda, breads, cookies, candy, ice cream, cakes, cereal bars and many others.

- **Agar Nectar**

•Agave nectar, also called agave syrup, is a very popular sweetener produced from the agave plant.

•It is commonly used as a "healthy" alternative to sugar because it doesn't spike blood sugar levels as much as many other sugar varieties.

•However, agave nectar contains about 70–90% fructose, and 10–30% glucose.

Addendum: Sugars that contain both Sucrose and Fructose

1. Beet sugar	12. Date sugar	24. Maple syrup
2. Blackstrap molasses	13. Demerara sugar	25. Molasses
3. Brown sugar	14. Evaporated cane juice	26. Muscovado sugar
4. Buttered syrup	15. Florida crystals	27. Panela sugar
5. Cane juice crystals	16. Fruit juice	28. Raw sugar
6. Cane sugar	17. Fruit juice concentrate	29. Refiner's syrup
7. Caramel	18. Golden sugar	30. Sorghum syrup
8. Carob syrup	19. Golden syrup	31. Sucanat
9. Castor sugar	20. Grape sugar	32. Treacle sugar
10. Coconut sugar	21. Honey	33. Turbinado sugar
11. Confectioner's sugar	22. Icing sugar	34. Yellow sugar
(powdered sugar)	23. Invert sugar	

Addendum: Sugars with Glucose (either pure glucose or combined with other sugars than fructose)

- Barley malt
- Brown rice syrup
- Corn syrup
- Corn syrup solids
- Dextrin
- Dextrose
- Diastatic malt
- Ethyl maltol
- Glucose
- Glucose solids
- Lactose
- Malt syrup
- Maltodextrin
- Maltose
- Rice syrup

Source: https://www.healthline.com/nutrition/56-different-names-for-sugar

Addendum: Sugars with Fructose only and Other Sugars

Fructose Sugars

- There are two types of sugars that only contain fructose. They are:
  - Crystalline fructose
  - Fructose
- Fructose is metabolized by the liver. This can cause a number of health issues.

- Source: https://www.healthline.com/nutrition/56-different-names-for-sugar

Other Sugars

- Two other types of sugars are:
  - D-ribose
  - Galactose

Addendum: Sugars -Fructose

- One type of sugar, fructose, is worth mentioning as a separate topic.
- One, fructose raises the blood lipids (cholesterol)
- Two, decreases cell sensitivity to insulin
- Three, does not cause satiety like glucose. In other words, the body will continue to crave sugar when it is fructose.
- Four, it stresses out the liver.
- Five, it negatively impacts on the regional cerebral blood flow in the brain.

Note: Agave nectar, honey, fruit juice, HFCS, and sucrose are high in fructose.

Source: Holistic Keto for Gut Health (2020) by Kristin Grayce McGary. (Publisher: Findhorn Press)

Addendum: Sugar Cravings

Sugar cravings may be a sign of specific and a number of nutritional deficiencies. They can be:

- Calcium
- Carbon
- Chloride/Silicon
- Chromium
- Magnesium
- Nitrogen
- Phosphorus
- Sulfur

Source: Holistic Keto for Gut Health (2020) by Kristin Grayce McGary. (Publisher: Findhorn Press)

Note: A separate handout is available for strategies to deal with sugar cravings.

Addendum: Sugar Cravings -Strategies to Reduce Cravings

- Cut back on Sugar-Filled Drinks
- Avoid Sugar-Loaded Desserts
- Avoid Sauces With Lots of Sugar
- Eat Full-Fat Foods
- Eat Whole foods
- Check for Sugar in Canned Foods
- Be Careful with So-Called “Healthy” Processed Snack Foods
- Avoid Sugar-Filled Breakfast Foods
- Read Labels
- Eat More Protein and Fat
- Consider Natural Sweeteners
- Don’t Keep Sugar in the House
- Don’t Shop When You’re Hungry
- Get Enough Sleep

Note #1: It helps to gradually change the palate to crave or desire more sweetness to less sweetness.

Source: https://www.healthline.com/nutrition/14-ways-to-eat-less-sugar

Addendum: Toxic Exposure

- While excessive sugar consumption plays a major role in the development of diabetes, especially type 2, exposure to toxins can cause problems.
- They are called persistent organic pollutants (POPs).
- Dr. Joseph Pizzorno, ND is finding that massive increase in the body's load of toxins plays a role in developing diabetes. The worst chemicals are:
    - Arsenic (heavy metal) –decreases insulin production
    - BPA (bisphenol A) –blocks insulin receptor sites
    - PHA (polycyclic aromatic hydrocarbons) -Polycyclic aromatic hydrocarbons (PAHs) are a class of chemicals that occur naturally in coal, crude oil, and gasoline. They also are produced when coal, oil, gas, wood, garbage, and tobacco are burned.
    - Phthalates -are esters of phthalic anhydride. They are mainly used as plasticizers, i.e., substances added to plastics to increase their flexibility, transparency, durability, and longevity.
- Once they have entered the body, they store and accumulate in the fat, and are difficult to get rid of.

Source: https://anh-usa.org/the-great-diabetes-lie/

Conclusion

- In summary, this presentation covers two types of sugars, the processed sugars stripped of their nutrients and the plant based sugars located in within foods and known as whole foods.
- Furthermore, there are different types of sugars, based on their molecular structure and composition. Some of these sugars play a role in surprising ways.
- The other issue is the per capita consumption of sugar. It still remains extremely high. Also, sugar can be found in a number of over the counter medications like Dayquil, and etc.
- The next stage of medicine will focus on what we eat along with our spiritual and emotional needs.
- It will reduce the need for prescription drugs as well as on vaccinations and surgery.
- Remember, our most important asset is our health, yours, others, and everyone else. It starts with what we eat as well as what our bodies are able to absorb.
- Food is our medicine.