

TWO WHITE ENEMIES: SALT AND SUGAR: 1I. CONSUMPTION OF SUGAR: PROS AND CONS

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Abstract: It is very difficult to answer the question, what is sugar? The possible answers may be surprising. It is easy to become confused by the various sugars and sweeteners described in the literature. All sweet things are not sugars and all sugars are not sweet. So it is important to know about and from where did “Sugar” originated. The results suggest that the sugar formed in the solar system and made their way to earth via meteorites. Researchers from Tohoku University and NASA Goddard Space Flight Centre have found ribose sugar differing from terrestrial biological sugars indicating their extra terrestrial origin. It is not clear which and how much sugars are formed on the prebiotic Earth. With the current research evidencing the delivery of bio-essential sugars, it is plausible that extraterrestrial sugar contributed to the formation of primordial RNA on the prebiotic Earth. This in turn has the possibility of being a factor in the origin of life, since the Ribose sugar is the back bone of RNA. Every living thing on the earth uses glucose for energy. Every cell in our body needs energy to function. Sucrose is no longer the sugar of choice but it's now fructose. If our diet was like that of people a century ago, we could have consumed about 15 grams per day—a far cry from the 73 grams per day the typical person gets from sweetened drinks. Amazingly, 25 percent of people actually consume more than 130 grams of fructose per day.

Dextrose, fructose and glucose are all monosaccharides, known as simple sugars. The primary difference between them is how our body metabolizes them. Glucose and dextrose are essentially the same sugar that is why food manufacturers usually use the term “dextrose” in their ingredient list. The simple sugars can combine to form more complex sugars, like the disaccharide sucrose (table sugar), which is half glucose and half fructose. High fructose corn syrup (HFCS) is 55 percent fructose and 45 percent glucose. Honey is about 53 percent fructose, but is completely natural in its raw form and has many health benefits when used in moderation, including as many antioxidants as spinach. Agave syrup, falsely advertised as “natural,” is typically HIGHLY processed and is usually 80 percent fructose. The end product does not even remotely resemble the original agave plant. Stevia is a highly sweet herb derived from the leaf of the South American Stevia plant, which is completely safe (in its natural form). Lo han (or luohanguo) is another natural sweetener, but derived from a fruit. In vegetables and fruits, it's mixed in with vitamins, minerals, enzymes, and beneficial phytonutrients, all which moderate the negative metabolic effects. Making matters worse, all of the fibre has been removed from processed foods, so there is essentially no nutritive value at all. And the very products most people rely on to lose weight the low-fat diet foods are often the ones highest in fructose. It is not that fructose itself is bad but the massive doses we're exposed to that make it dangerous.

Keywords: Artificial sweeteners

Sugar - An enemy of beautiful face: sweet taste:

Sweetness is often described as the pleasure taste, signaling the presence of sugar, which is a core source of energy and hence, desirable to the human body. It is no wonder that this is a taste that even babies gravitate too. Furthermore, when used in a combination, sweet complements well with the other basic tastes (Figs. 1,2). Almost every person salivates (excessively produce saliva) over sweets. One does not need a special occasion to get their sweet tooth going. While the lip-smacking sugary delight might impress the taste buds, it is sure to affect the health in a big way. "Sugar, in particular, releases brain chemicals, like serotonin, that make us feel good [1].

This good feeling leaves us wanting to experience the same over and over again, day after day. Many people say they're 'sugar addicts, consuming real sugar and artificial sweeteners in various forms. In the brain, sugar stimulates the "feel-good" chemical dopamine. This euphoric response makes sense from an evolutionary perspective, since our hunter-gatherer ancestors predisposed to "get hooked" on sugar probably had a better chance of survival however some scientists argue that sugar is an addictive drug [2].

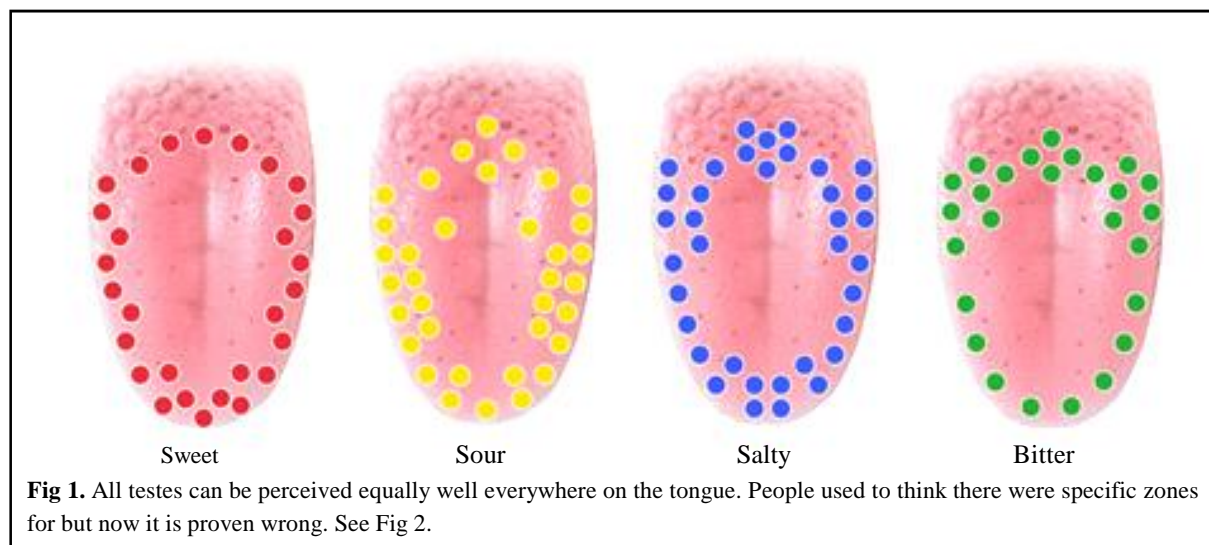
We have been told for years now that sugar is the cause of all our health problems, such as weight gain, digestive problems, sluggishness, insulin resistance and diseases. More and more health experts put the blame on too much sugar in the diet for all these health issues. It's all true that sugar can be extremely hazardous to our health. But this depends on two critical factors, *viz.*, 1. Quantity of sugar consumed. 2. Type of sugar consumed.

Consumed in moderation, sugar is helpful as a source of energy *i.e.* provided it is obtained from the right sources. We humans evolved to get our sugar by eating whole foods like fruits,

vegetables, and even honey. Our body knows how to extract the maximum benefit from these whole foods.

Sugar" is a generic term used to identify simple and complex carbohydrates, which includes monosaccharides such as fructose, glucose and galactose; and disaccharides such as maltose and sucrose (white table sugar). Sugar is practically everywhere, in every food item more so in all precooked and ready to eat food. High sugar intake could be avoided since sugar has no nutritional value other than to provide calories. To improve the overall nutrient density of the diet and to help reduce the intake of excess calories, individuals should be sure not to displace foods with essential nutrients or increasing calorie intake with food high in added sugar.

Because of over consumption of sugar according to the WHO, nearly 30% people are obese. Obesity rates in children have risen 50% in recent years. Carbohydrates, the basic material for all breads, potatoes, cakes and snack foods are quickly converted by the body into simple sugar, and pure refined sugars such as, sucrose, dextrose, fructose, corn syrup, maltodextrin and then stored as fat. Due to obesity problems cutting sugar from diet is quite trendy these days. Many dieters even go so far as to proudly proclaim that they have "stopped eating sugar" all together. Well, in reality



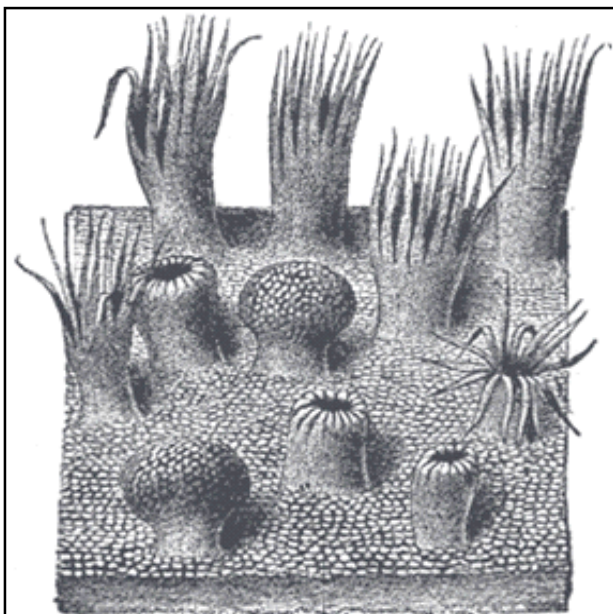


Fig. 2. Tongue's condition (opening of test buds) when we eat sugary, salty sour or bitter things.

that probably is not even possible. They naively think that cutting out cake, cookies and candy means that they are no longer eating sugar.

Unfortunately it is hard to find any processed food products these days without some form of added sugar. A can of popcorn can easily contain eight tablespoons of refined sugar. France and Australia have been forced to produce sweeter wines to cater to the sugar-craving U.S. market. In India too sugar lobby is strong and they influence the political parties. Joining the sugar industry in opposing the WHO campaign are America's biggest food and drink producers, led by the mighty Coca-Cola Company, and sugar exporting nations.

The UN found that 60% of disease worldwide is now caused by cardiovascular ailments, which are directly linked to over-consumption of sugar, saturated and trans-fats, and increasing lack of exercise caused by too much TV viewing. All developed nations face this problem to varying degrees. In the Middle East, Pakistan and India, over-consumption of fats and sugar are now the gravest public health problem after malnutrition.

Most experts agree that sugar in its pure form is not inherently "bad". The problem with sugar is that it packs a lot of calories per serving in addition to more consumption of larger portions of those foods due to better taste to most people. A new WHO guideline

recommends adults and children reduce their daily intake of free sugars to less than 10% of their total energy intake. A further reduction to below 5% or roughly 25 grams (6 teaspoons) per day would provide additional health benefits [3].

In the same way, sugars eaten outside their normal context of whole, complete foods run riot in our bodies leaving us exhausted, overweight, and sick. The sugar from a grocery store, processed foods, and packaged desserts is made in large scale, industrial refineries using cheap, mass-farmed crops like sugar beets and sugar canes. Food manufacturers extract the sugary pulp from the rest of the plant. They strip away all trace of healthy minerals and nutrients which normally remains in jiggery.

The refined sugar from grocery stores leaves you with a hyper-concentrated dose of empty calories that cause all kinds of chaos in your body. Without the "burn-control" you normally get when you eat sugar that's part of a whole food, the body can't control the fire. And so we end up with heart disease, weight gain, chronic fatigue, weak immune systems, gut problems and cancer.

Many so-called "natural sweeteners" like raw sugar, corn syrup, and agave nectar are all highly refined. One study done at Princeton found these alternatives cause just as much (if not far more) damage to the body than white sugar [4]. The body just does not know how to properly use these concentrated, "unnatural" sugars. High-fructose corn syrup prompts considerably more weight gain. There are several major problems with honey. It's un-patentable and not as cheap to manufacture in mass quantities as refined-sugar. That makes selling processed sugar far more profitable than selling honey.

As mentioned earlier, sugar causes a spike in the blood-sugar levels followed by a huge crash. Because your blood-sugar level is a key signal for appetite and hunger, this crash triggers major warning alarms in your body. Our brain starts thinking that we are starving to death. And in response, it compels us to eat immediately - especially foods that have quick, cheap calories like sugar.

Raw sugar: Jiggery: Jiggery is an unrefined natural sweetener. In Ayurveda, jiggery is used since ages to help treat a wide range of health problems including, anxiety, migraines, digestion and fatigue.

However, jiggery is still a type of sugar, and people should consume it in moderation. Jiggery is more chemically complex than sugar, and it consists of longer chains of sucrose. It takes longer to digest and does not release energy as quickly as refined sugar making it easier on the body. Using jiggery in place of refined white sugar will add a minimal amount of extra nutrients into a person's diet. However, a person should not add more jiggery to food just to boost their nutrient intake. It is better to get vitamins and minerals from less calorific sources. Therefore, it is advisable to use jiggery in moderation.

Composition of Jiggery: Jiggery is slightly more nutritious than refined white sugar, according to a recent study [5]. Regular refined white sugar contains no protein, fat, minerals, or vitamins. In addition to 375 calories, a 100 g serving of jiggery contains the following (sucrose: 65-85 g; fructose and glucose: 10-15 g; protein: 280 milligrams (mg); potassium: 1056 mg; magnesium: 70-90 mg; calcium: 40-100 mg; manganese: 0.2-0.5 mg; phosphorus: 20-90 mg; iron: 11 mg; vitamin A: 3.8 mg; vitamin C: 7.0 mg; vitamin E: 111.30 mg. However, that these figures are for a 100 g serving, which is about 1/2 cup. Most individuals would eat much less sugar at one time, which would be closer to 1 teaspoon, or 7 gms.

Advantages of jiggery over refined sugar: Some people consider it a super food, because it has more vitamins and minerals and lower sucrose content than sugar. There is less incidence of diabetes in areas with consistent jiggery use. Researchers believe that the magnesium present in jiggery boosts nervous system function and that jiggery's high iron content may protect against anaemia. A review of 46 academic papers found there may be a link between jiggery consumption and antitoxicity and cytoprotective effects, as well as anticarcinogenic effects [6]. It also suggests that consuming jiggery may strengthen the immune system and lower the risk of diabetes and hypertension. However, more research is necessary.

A recent review also notes that regular use of jiggery is helpful to relieve constipation, increase energy levels, relieve stress, treat premenstrual syndrome, have antioxidant and anticarcinogenic properties, aid in digestion, detox the liver and blood and also treat lung and bronchial infections [7]

Packed with all the essential nutrients, jiggery is the

favourite of many. In Ayurveda, jiggery is used since ages to help treat a wide range of health problems including, anxiety, migraines, digestion and fatigue. It is worth noting that these claims are largely anecdotal, and little evidence-based research exists to support them.

Disadvantages of jiggery: Jiggery is associated with several serious conditions [6,7]. Jiggery is definitely not a food for people who are dieting. 100 grams jiggery contains 385 calories. Though consuming a little amount would not really hurt but too much of it, may lead to weight gain. Though it has good nutrients Jiggery is rich in carbohydrates and therefore better to get nutrients with fewer calories. 10 grams of jiggery has 9.7 grams of sugar. It raise the blood sugar levels and cause cardiovascular disease. Further too much use of jiggery create risk of parasitic infections. Jaggery is usually made in villages under unhygienic conditions and thus many a times is laden with microbes, which may or may not affect your health. It can increase your risk of getting intestinal parasites and worms, non alcoholic fatty liver disease, some types of cancer, can lead to nose bleeding, increase inflammatory conditions like rheumatoid arthritis. Studies have also found sucrose can interfere with omega-3 fatty acids, thus increase inflammation. According to Ayurveda, fish and jiggery should never be consumed together as it can lead to some serious side effects. Also, if you are suffering from ulcerative colitis then you should avoid consuming jiggery at all cost. According to the Dietary Guidelines for Americans, 2020-2025, a person should limit their daily intake of added sugar to less than 10% of total calories [8].

Honey: The bittersweet truth: Honey is a sweet, golden liquid made by honeybees, it contains powerful antioxidants. A bee lives less than 40 days and can visit up to 5,000 flowers in a single day. In order to produce 1 pound of honey, 2 million flowers must be visited. A hive of bees must fly 55,000 miles to produce a pound of honey [9]. It's true — honey does contain enzymes, antioxidants, non-harem iron, zinc, potassium, calcium, phosphorous, vitamin B6, riboflavin and niacin. But in amounts typically consumed (let's say about 1 tablespoon), honey is not considered a "good source" of any of these vitamins and minerals. It has less than 1 percent of your recommended daily allowance recommended daily allowance (RDA) per serving. Nevertheless, honey is still a sugar may be a natural sugar however

some do not considered it a natural sugar like the sugar in fruits. While refined sugar is made from 100 percent sucrose (glucose + fructose), honey is made from 75 percent sucrose. The other 25 percent is made up of mostly water. Sugar and honey are calorically similar at about 50-60 calories per tablespoon.

Honey provides a range of health benefits. People have used raw honey in traditional medicine for hundreds of years. This sweet, natural substance may contain healthful elements that processed honey does not have. Some evidence suggests that honey may have antioxidant and anti-inflammatory powers that can benefit the brain. It also have a soothing effect on digestion, helping with symptoms of diarrhoea. Honey may provide an effective way to decrease the severity and frequency of a child's night time cough. Numerous studies have suggested that honey works well as a wound healing dressing, since it has antibacterial and anti inflammatory properties [10]

Sugar and health problems: Added sugars are a controversial and highly debated topic. Consumption of added sugars has been implicated in the increased risk of a variety of chronic diseases including obesity, cardiovascular disease, diabetes and non-alcoholic fatty liver disease (NAFLD) as well as cognitive decline and even some cancers. While it is prudent to consume added sugars in moderation, the reduction of these components of the diet without other reductions of caloric sources seems unlikely to achieve any meaningful benefit [11].

High-sugar diets and nutritional adequacy: Diets high in sugar may adversely affect nutritional adequacy. Foods high in extrinsic sugar include soft drinks, candy, pastry, and cereals with high sugar content. Fat-free manufactured foods are often high in calories because of inclusion of high amounts of sugar. American Heart Association dietary guidelines stress consumption of fruits, vegetables, grains, and complex carbohydrates so that nutritional requirements for vitamins and minerals may be met by whole foods rather than by foods that are supplemented with vitamins. High-sugar foods displace whole foods (e.g., soft drinks displace milk and juice consumption in children) and contribute to nutritional deficiencies, adding empty calories. Some studies that have assessed the nutritional adequacy of high-sugar diets do not necessarily show differences in vitamin and mineral intake because of

the supplementation of these foods with vitamins and minerals instead of the preferred intake of these elements through the diet. Among children in the Bogalusa Heart Study a linear decrease in the intake of many essential nutrients was associated with increasing total sugar intake.

Blood sugar: Blood sugar imbalance is the fifth most dangerous problem right behind tobacco use, blood pressure problems, weight problems and physical inactivity. Several prospective studies have been conducted to examine the relationship between fruit juice intake and risk of incident type 2 diabetes, but results have been mixed. A total of four studies (191,686 participants, including 12,375 with type 2 diabetes) investigated the association between sugar-sweetened fruit juice and risk of incident type 2 diabetes, and four studies (137,663 participants and 4,906 cases) investigated the association between 100% fruit juice and risk of incident type 2 diabetes. A higher intake of sugar-sweetened fruit juice was significantly associated with risk of type 2 diabetes (RR = 1.28, 95%CI = 1.04-1.59, p = 0.02), while intake of 100% fruit juice was not associated with risk of developing type 2 diabetes (RR = 1.03, 95% CI = 0.91-1.18, p = 0.62). Research observations support dietary recommendations to limit sugar-sweetened beverages, such as fruit juice with added sugar [12]., to prevent the development of type 2 diabetes (Fig.3) Evidence about the association between monosaccharides intake and obesity is insufficient, as well as between the intake of sucrose or added sugars and the risk of obesity in adults and children [13].

Indian standards: Fasting blood sugar level less than 100 mg/dL (5.6 mmol/L) is normal. Fasting blood sugar level from 100 to 125 mg/dL (5.6 to 6.9 mmol/L) is considered prediabetes. If it is 126 mg/dL (7 mmol/L) or higher on two separate tests, it is a sign that the patient has diabetes (Table 1) [14].

Hyperglycemia: The diets of our ancestors which consisted of vegetables, lean meat, whole grains, nuts, seeds and fruits, is estimated to have promoted healthy blood glucose levels between 60 and 90 mg/dL. Today's typical diet high in refined sugar is promoting abnormally high blood sugar levels and unprecedented unhealthy effects in blood-sugar metabolism. Excess blood glucose can initiate yeast overgrowth, blood vessel deterioration, diabetes, heart disease, increased rate of infections and many other

adverse health conditions (Table 1).

Condition	2 hour glucose	Fasting glucose	HbA1c
	mmol/l(mg/dl)	mmol/l(mg/dl)	%
Normal	<7.8 (<140)	<6.1 (<110)	<6.0
Impaired fasting glycaemia	<7.8 (<140)	= 6.1(=110) & <7.0(<126)	6.0–6.4
Impaired glucose tolerance	=7.8 (=140)	<7.0 (<126)	6.0–6.4
Diabetes mellitus	=11.1 (=200)	=7.0 (=126)	=6.5

Table 1: Showing glucose levels in normal and diseased conditions. Note in diabetic patients after 2hrs the glucose levels go very high compared to fasting glucose [14].

Diabetes mellitus, often simply referred to as diabetes, is a group of metabolic diseases in which a person has high blood sugar, either because the body does not produce enough insulin, or because cells do not respond to the insulin that is produced. This high blood sugar produces the classical symptoms of polyuria (frequent urination), polydipsia (increased thirst) and polyphagia (increased hunger).

We need a balance of sucrose, glucose, fructose and other natural sugar-based nutrients for optimal health and keeping you alive. But your body simply was not designed to consume 170 lbs of refined sugar every year. It is this excess sugar that is causing you the real problem. When the body is bombarded with sugar it triggers a process called glycation. Glycation is a reaction that happens when rogue sugar molecules attach themselves to healthy proteins, lipids or various types of cells and tissues in our body.

This cross-linking, or “hooking up,” results in the formation of mutant molecules called Advanced Glycation End-products—or (AGEs) . AGEs are vicious little mutants’ useless compounds.

The skin collagen undergoes extensive cross-linking and glycation, as well as increased AGEs formation when rats are fed a high fructose diet. These mutant AGEs turn our healthy, soft, supple tissues stiff as a board, moreover AGEs crowd out our healthy cells and rob them of essential nutrients they need to stay alive. Since AGEs operate “under the radar” within our immune system, they can secretly accumulate in your body for years and trigger a host of health problems. For example, When sugar molecules cross-link with protein cells in your eyes, they become

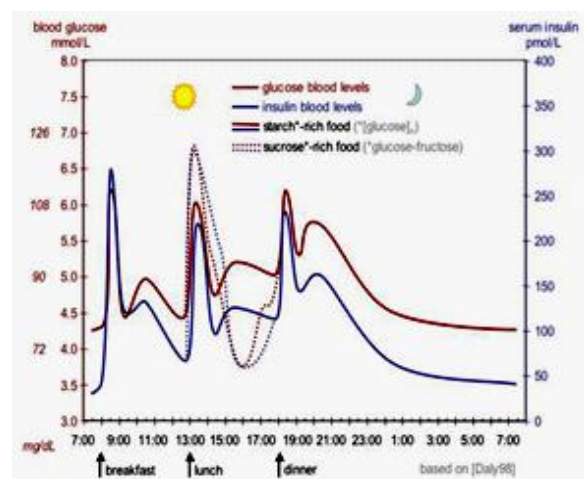


Fig. 3: Glucose levels in the blood vis-a-vis insulin levels after breakfast, lunch and dinner when a person takes starch rich and/or sucrose rich food.lunch [13].

mutant AGEs that turn your soft, delicate, crystalline lens cloudy and hard and wreck your eyesight. Sugar attacks the proteins in your eye lenses and can cause cloudy vision resulting in cataracts and near sightedness. When sugar molecules hook-up with arterial proteins, they create AGEs that harden your soft and flexible arteries until your veins become so stiff and thick to prevent healthy blood flow.

Harmful effects of sugar on the skin: If you thought that sugar was only bad for your waistline and general health, then you need to know that it is equally harmful to your skin. In fact, it can lead to serious dermatological conditions.

What we eat reflects on our body externally. A number of internal changes can influence the external appearance of the body. Excessive intake of carbohydrates, starch and sugar can have an adverse effect on the skin and also accelerate the ageing process. But what triggers these complications needs to be understood and discussed in detail.

Carbohydrates can be simple or complex. Simple carbohydrates (cake, bread; to name a few) break down and convert to glucose rapidly. Increased glucose level indicates towards increased insulin level, and causes inflammation, which affects the whole body. The enzymes produced during inflammation breaks down important proteins, namely elastin and collagen, leading to wrinkles and saggy skin. And when sugar molecules bind with collagen cells, AGEs build up and dry out your skin layers to create premature aging and wrinkles making you look old before your time.

Corrective measures to check the harmful effects of sugar on the skin:

- # With a little care and preventive measures, the deleterious effects of sugar on the skin can be minimized.
- # Supplement your diet with foods rich in antioxidants. Lean proteins, fibrous foods and diets rich in good fats are highly recommended. Include beans and nuts that have low glycemic value in your diet. Drink plenty of water.
- # Food items containing a high amount of saturated fats (cheese, ice creams, fried foods; to name a few), and with high glycemic value should be strictly avoided.
- # do not compromise with sleep. Sound sleep and stress-free life is the mantra to glowing and youthful skin.
- # practice meditation and yoga diligently.
- # do not skip meals or indulge in overeating. Have small servings at regular intervals.

AGEs can turn the lacy tissues in the filter units in your kidneys, called nephrons, into fibrous, rubbery compounds that block healthy kidney function. Sugar can increase kidney size and produce pathological changes in the kidney such as the formation of kidney stones. Sugar adversely affects urinary electrolyte composition. AGEs put a heavy coat of gunk on delicate nerve tissues and prevent them from properly communicating with your brain. And they create inflammation in your brain cells that can hinder your memory recall and create serious “senior moments!”

Up until a decade ago, scientists had no clear-cut solution to the AGEs problem though they knew it existed. Since no solution was available it was taken for granted as a part of the normal aging process. But thanks to a group of dedicated researchers such as, Anthony Cerami, of Rockefeller University in New York and Dutch scientist M.A.J.S. van Boekel, of the University of Nijmegen due to their efforts. Now we can use targeted nutrients to clobber AGEs in two amazing ways: 1: Block the formation of AGEs and/or 2: Remove AGEs present in the body. The powerful antioxidant called n-acetyl cysteine (NAC), cells now have a fighting chance. NAC is such a stellar amazing nutrients gives the cells healthy protection and longevity.

Pharmaceutical agents that prevent AGE formation, break cross-links or block AGE receptors, reduce

vascular and myocardial stiffness, inhibit atherosclerotic plaque formation and improve endothelial function. When NAC was added to the sugary bath water, it prevented blocked sugar molecules from cross-linking with the proteins.

This scientific study was reported in the journal of Peritoneal Dialysis International that NAC a powerful AGE blocker, successfully inhibited the formation of carboxymethyl-lysine (CML) a major glycation toxin in type 1 collagen proteins after incubation for 16 weeks with glucose. Taking NAC along with carnosine which you already get in Ultimate AGE Defense™—also lowered AGE-induced cell death in skin cells. These Collagen makes up one-third of your body’s proteins and has a slow turnover rate. That is why collagen is especially vulnerable to glycation causing healthy collagen strands to lose their elasticity and firmness resulting in premature wrinkles, dryness and sagging. As you get older, the body’s ability to naturally prevent glycation decreases and this speed up the aging process depending on the type of sugar we eat. A study printed in the Annals of the New York Academy of Sciences show young human skin cells age rapidly when exposed to glucose.

AGEs speed up the aging of cells, which may contribute to a variety of chronic and fatal diseases. Acne problems mainly arise from Glycation (the process through which digested sugar attaches permanently to the collagen).

Lipoic acid: To naturally increase the body’s ability to use sugar molecules such as glucose. More the glucose one can naturally use up, the less one will have roaming in the body as excess sugar looking to create mutant AGEs. Plus, lipoic acid effectively recycles vitamins C and E and glutathione, which further blocks protein glycation and AGE formation.

Guava: The Journal of Agricultural and Food Chemistry rates guava as a strong inhibitor of protein glycation in human cells exposed to high glucose concentrations in vitro. Other studies are showing guava extract can significantly inhibit low-density lipoprotein (LDL)-bad cholesterol glycation, which suggests that this powerful herb is also a heart and brain ally [15].

Vitamin B1 (in the form of benfotiamine)- As the highly bioavailable form of vitamin B1, benfotiamine works by blocking three of the major biochemical

pathways that cause high blood sugar levels to trigger inflammatory damage on your cells. Vitamin B1 also enhances the activity of an enzyme called trasketolase, which is essential for maintaining normal glucose traffic. So sugar molecules can move quickly throughout your body. Mussels, Asparagus, Acorn Squash, brown Rice, firm Tofu, green Peas, navy Beans, flax Seeds, fish (Salmon) and lean Pork are some source of Vitamin B1.

Yerba Mate—consumed as a tea in many South American countries is now a proven anti-glycation nutrient. One recent study shows the caffeic acid contained in yerba mate can inhibit 95% of AGE formation. A study printed in Diabetes metabolism research reviews shows that vitamin B6 prevents platelets from clumping together in rats injected with AGEs. Additional research shows B6 can protect deoxyribonucleic acid (DNA) from free radical damage. Scientists are finding a link between AGEs and high homocysteine levels which can lead to serious heart problems.

Diseases: Sugar is found to be a contributing factor for the prognosis of many diseases in humans. Sugar has the potential of inducing abnormal metabolic processes in normal, healthy individuals, thereby promoting chronic degenerative diseases. High sugar intake can impair the physiological homeostasis of many systems in our body, since it lowers the ability of enzymes to function. Sugar can impair the structure of your DNA, can change the structure of protein and cause a permanent alteration of the way the proteins act in your body.

Sugar and mental health (the “sugar blues”): Late 17th century, after sugar consumption in Britain had zoomed, physicians in London began to observe and record terminal physical signs and symptoms of the “sugar blues”. Meanwhile, when sugar eaters did not manifest obvious terminal physical symptoms and the physicians were professionally bewildered, patients were no longer pronounced bewitched, but mad, insane, emotionally disturbed. Any one problem such as laziness, fatigue, debauchery, parental displeasure was sufficient causes for people under twenty-five to be locked up in the first Parisian mental hospitals. Initially, when the General Hospital was established in Paris by royal decree, one percent of the city’s population was locked up. From that time until 20 century, as the consumption of sugar went up and up especially in the cities so did the number

of people who were put away in the General Hospital. Three hundred years later, the “emotionally disturbed” can be turned into walking automatons, their brains controlled with psychoactive drugs. Today, pioneers of orthomolecular psychiatry, such as Dr. Abram Hoffer, Dr. Allan Cott, Dr. A. Cherkin as well as Dr. Linus Pauling, have confirmed that mental illness is a myth and that emotional disturbance can be merely the first symptom of the obvious inability of the human system to handle the stress of sugar dependency. Dr. Pauling writes: “The functioning of the brain and nervous tissue is more sensitively dependent on the rate of chemical reactions than the functioning of other organs and tissues. I believe that mental disease is for the most part caused by abnormal reaction rates, as determined by genetic constitution, diet, and by abnormal molecular concentrations of essential substances. Selection of food (and drugs) in a world that is undergoing rapid scientific and technological change may often be far from the best.”

In Megavitamin B3 Therapy for Schizophrenia, Dr. Abram Hoffer notes: “Patients are also advised to follow a good nutritional program with restriction of sucrose and sucrose-rich foods.”¹² Clinical research with hyperactive and psychotic children, as well as those with brain injuries and learning disabilities, has shown very clearly an abnormally high family history of diabetes—that is, parents and grandparents who cannot handle sugar; an abnormally high incidence of low blood glucose, or functional hypoglycemia in the children themselves, which indicates that their systems cannot handle sugar. Enquiry into the dietary history of patients diagnosed as schizophrenic reveals the diet of their choice is rich in sweets, candy, cakes, coffee, caffeinated beverages, and foods prepared with sugar. These foods, which stimulate the adrenals, should be eliminated or severely restricted [16].

In the 1940s, Dr John Tintera rediscovered the vital importance of the endocrine system, especially the adrenal glands [17]. In 200 cases under treatment for hypoadrenocorticism (the lack of adequate adrenal cortical hormone production or imbalance among these hormones), he discovered that the chief complaints of his patients were often similar to those found in persons whose systems were unable to handle sugar such as atique, nervousness, depression, apprehension, craving for sweets, inability to handle alcohol, inability to concentrate, allergies, low blood pressure.

Dr. Tintera finally insisted that all his patients submit to a four-hour glucose tolerance test (GTT) to find out whether or not they could handle sugar. A GTT (Glucose tolerance test) can be performed on a young child by the micro-method without undue trauma to the patient. While Tintera's sweeping implication of sugar as a cause of what was called "schizophrenia" could be confined to medical journals, he was let alone, ignored. Along comes someone who says none of this matter: take them off sugar and keep them off it. Today, doctors all over the world are repeating what Tintera announced years ago that nobody, but nobody, should ever be allowed to begin what is called "psychiatric treatment", anyplace, anywhere, unless and until they have had a glucose tolerance test to discover if they can handle sugar.

Take the load off now by eliminating sugar in all forms and guises, starting with that soda pop you have in your hand. How many patients would have listened if the local healer had told them that the only thing ailing them was sugar blues? [18]

Keeping sugar-free key to neuron health:

Although scientists already know that sugar is bad for neurons, a team of Spanish researchers have shown, against the general consensus, that mouse neurons can make long chains of glucose (glycogen), it is just that the machinery to complete this process is kept safety 'locked away' by a complex of two proteins, laforin and malin. In Lafora disease, this lock appears to be broken through mutations in the genes that produce laofrin and malin. This rare disease causes irreversible neurodegeneration in adolescents and generally presents as epileptic seizures between 10 to 17 years of age and later on as myoclonus (involuntary twitching of the arms and legs). Its evolution is marked by progressive degeneration of the nervous system which reduces the patient to a terminal vegetative state ten years after its onset. No treatment is available.

Joan Guinovart, Institute for Research in Biomedicine, Barcelona, explained: "We have observed that laforin and malin act jointly as 'guardians' of glycogen levels in neurons and are stimulated by the degradation of the proteins responsible for glucose accumulation [19]."

Specifically they induce the proteasome-dependent degradation of muscle glycogen synthase (MGS) and protein targeting to glycogen (PTG), which helps

activate MGS. These findings open up the possibility of finding a drug that could block sugar formation and so treat Lafora disease. Specifically they induce the proteasome-dependent degradation of muscle glycogen synthase (MGS) and protein targeting to glycogen (PTG), which helps activate MGS. If either of the two genes loses its function, these proteins are not degraded, glycogen accumulates and thus neurons deteriorate and cell suicide (apoptosis) ensues [20].

Sugar is an addictive substance, can be intoxicating, similar to alcohol. Decrease in sugar intake can increase emotional stability. Sugar can induce headaches, including migraines and dizziness and depression, fuzzy thinking and memory loss. Brain inflammation and poor electrical impulse communication to our neurons can make you feel like you are "losing your marbles!" Sugar can reduce the learning capacity, adversely affect our children's grades and cause learning disorders, increases delta, alpha, and theta brain waves, which can alter our ability to think clearly. Sugar can increase your risk of Alzheimer's disease. MRI studies show that adults 60 and older who have high uric acid are four to five times more likely to have vascular dementia, the second most common form of dementia after Alzheimer's. Intravenous feedings (I.Vs) of sugar water can cut off oxygen to our brain. Sugar increases your risk of polio, epileptic seizures. Sugar can cause a rapid rise of adrenaline, hyperactivity, anxiety, difficulty in concentrating, and crankiness in children. Sugar can impair the function of our adrenal glands. In juvenile rehabilitation centres, when children were put on low sugar diets, there was a 44 percent drop in antisocial behaviour. Sugar can worsen the symptoms of children with attention deficit hyperactivity disorder (ADHD).

Sugar intake increases carbohydrate fuel reserves and physical performance. However, this enhancement occurs only at exercise intensities and levels of physical activity associated with endurance performance of at least 30 minutes in duration. Blood glucose and liver and muscle glycogen provide the predominant fuels for muscle contraction. When these substances reach critically low amounts, fatigue may occur and consumption of sugar may rapidly return blood glucose levels to normal. For most low-to moderate-intensity activities like walking or housework, sugar consumption does not influence performance.

Another major area of interest has been the relationship between dietary sugar and behaviour and cognitive function. Relationship between sugar and hyperactivity was based on two hypotheses. The first was a possible allergic response; the second was that hyperactive children might experience functional reactive hypoglycemia. Neither of these hypotheses has been proved, and a meta-analysis of 16 randomized trials in hyperactive children showed that decreasing the sugar content of the diet resulted in no improvement in degree of hyperactivity. Sugar can increase our risk of gout [21]. Sugar contributes to eczema in children [22]. Sugar is found to induce emphysema [23]. Removal of sugar from diets has cured symptoms of crippling.

It is a well known fact that sugar causes negative effects on our bodies. Consuming an excess amount of sugar can lead to weight gain, a rise in blood sugar levels, and inflammation in the veins [24]. All of these effects from sugar stress our veins and contribute to the development of varicose veins over time.

Sugar can cause hormonal imbalances such as: increasing estrogen in men, exacerbating premenstrual syndrome (PMS), and decreasing growth hormone. Diets high in sugar will increase free radicals and oxidative stress [25]. Sugar can suppress our immune system and impair our defenses against infectious disease by greatly assisting the uncontrolled growth of *Candida Albicans* (yeast infections). Sugar can cause autoimmune diseases such as: arthritis, asthma, and multiple sclerosis [26].

In an immune cell study, 10 healthy people were assessed for fasting blood-glucose levels and the phagocytic index of neutrophils, which measures the ability of immune cells to destroy invaders such as cancer. Eating 100 grams of carbohydrates from glucose, sucrose, honey and orange juice all significantly decreased the capacity of neutrophils to engulf bacteria. Starch did not have this effect [27].

Sugar acts as:

- # Sugar upsets the mineral relationships in the body: causes chromium and copper deficiencies and interferes with absorption of calcium and magnesium.
- # Sugar can produce a significant rise in total cholesterol, triglycerides and bad cholesterol and a decrease in good cholesterol.

- # Sugar causes a loss of tissue elasticity and function.
- # Sugar can lower Vitamin E levels.
- # Sugar can increase systolic blood pressure.
- # Sugar can cause drowsiness and decreased activity in children.
- # High sugar intake can impair the physiological homeostasis of many systems in body.
- # Sugar intake is higher in people with Parkinson's disease.
- # Sugar can increase your body's fluid retention.
- # Sugar is enemy of your bowel movement.
- # Sugar can compromise the lining of your capillaries.
- # Sugar can cause headaches, including migraines.
- # Sugar can reduce the learning capacity, adversely affect your children's grades and cause learning disorders.
- # Sugar can cause depression.
- # Sugar can cause hormonal imbalances such as: increasing estrogen in men, exacerbating PMS, and decreasing growth hormone.
- # Diets high in sugar will increase free radicals and oxidative stress.
- # A high sucrose diet of subjects with peripheral vascular disease significantly increases platelet adhesion.
- # Your body changes sugar into 2 to 5 times more fat in the bloodstream than it does starch.
- # The rapid absorption of sugar promotes excessive food intake in obese subjects.
- # Sugar increases your risk of polio.
- # High sugar intake can cause epileptic seizures.

Sugar promotes cancer: Cancer has become the number one "killer disease in children" in the past few years. [28]. According to one estimation children on an average takes about 36 spoons per day. Sugar consumption is robbing the oxygen out of their little bodies and making their cells extremely acidic while shutting off their immune systems. Every doctor learned back in medical school all about Otto Warburg's discovery; a discovery of humongous proportions, because way back in the thirties Otto discovered the main biochemical cause of cancer, or what differentiates a cancer cell from a normal, healthy cell. For this discovery Otto Warburg was awarded the Nobel Prize in 1931. "Cancer has only one prime cause. It is the replacement of normal oxygen respiration of the body's cells by an anaerobic [i.e., oxygen-deficient] cell respiration [29]. Warburg's discovery tells us that cancer metabolizes much differently than normal cells. Normal cells need

oxygen but cancer cells despise oxygen so it became favourite therapy among many of the alternative clinic. Metabolism of cancer cells are approximately 8 times greater than the of normal cells through a process of fermentation. The cancer is constantly on the verge starvation and thus constantly asking the body to feed it as a result the body is constantly overworked trying to feed this cancer. When the food supply is cut off, the cancer begins to starve unless it can make the body produce sugar to feed itself. Sugar feeds cancer cells and has been connected with the development of cancer of the breast, ovaries, prostate, rectum, pancreas, biliary tract, lung, gallbladder and stomach. The medical establishment may be missing the connection between sugar and its role in tumorigenesis.

Many cancer sufferers could have a major improvement in the outcome of their disease if cancer's preferred fuel, glucose, was controlled. Eliminating refined sugar and adopting an optimal whole foods diet combined with top quality nutritional supplements and exercise, may be critical components in recovering from cancer.

Colas are extremely acidic with a pH of approximately 2.5. It takes 32 glasses of water with a pH of 10 to neutralize that one cola. And, keep in mind that most water is relatively neutral with a pH of 7.2. The wasting syndrome (cachexia) [30], is due to the body producing sugar from proteins (not from carbohydrates or fats, but from proteins) in a process called glycogenesis to feed the cancer. The body finally dies of starvation, trying to feed the cancer. However, those who have paid attention to this sugar craving cancer stuff have come up with some remarkable therapies for cancer. Laetrile is just one. Hydrazine Sulphate stops the process of glycogenesis in greater than 50% of all patients with cachexia is another.

If we insist loved ones, a cancer patient to take drinking a vanilla milk shake in an effort to make him feel better, we are giving him more acid elements (milk shake - sugar) causing his cellular pH to drop more into the pH range that cancer needs to survive within.

Evidence of the association of the intake of mono and disaccharides with different types of cancer is insufficient or there is evidence of lack of association. There is only possible evidence of a positive relation between the intake of monosaccharides (fructose and

glucose) and pancreatic cancer and positive association between glycemic index (GI) and colorectal cancer. But there is no association between GI and the risk of endometrial cancer, breast cancer and pancreas cancer [31].

Alternatives for refined sugar and its impact:

Now we have understood about refined sugar, so we look for alternatives, the synthetic ones sugar substitutes such as, aspartame (Nutra sweet, equal), saccharin (Sweet 'N low, sugar twin), acesulfame K (sunett, sweet one) and sucralose [32].

Nutra sweet, which is made from aspartame. Aspartame is 10% wood alcohol that our body metabolizes into various carcinogens (One of them is DKP, which may cause brain tumours). Sucralose, for example sounds a lot like sucrose is an artificial sweetener that is 600 times sweeter than sucrose, twice as sweet as saccharin, and 3 times as sweet as aspartame.

And it's created by injecting a molecule of chlorine into sucrose. A very important piece of information to have when we are deciding on a sweetener, that is healthy for us. Users of synthetic sugars generally complaint such as, headaches, dizziness, mood changes, numbness, vomiting, nausea, muscle cramps and spasms, abdominal pain, vision problems, skin lesions, memory loss and seizures.

Knowing what cancer loves, the cancer patient should avoid them. Cancers likes cooked foods over raw (cooking destroys enzymes and heat sensitive vitamins), so check out our article on the cancer diet. Then there are the food therapies: aimed at starving cancer.

Adding to the long list of the beneficial effects of fasting, Dr. PD Gupta and his team found that during fasting a lot of metabolic energy was saved. He experimentally proved that during fasting the intestinal epithelial cell membrane underwent drastic changes. The protein and cholesterol contents of the membrane get depleted and the lipid molecules reoriented to absorb more nutrients [33].

Gupta also explained that several physiological and/or pathological conditions like dietary composition, postnatal maturation, diabetes and intestinal "resection" were associated with selective alternations in the percentage composition of lipids

in the membrane. He is of strong opinion that beneficial effects of fasting ranged from energy conservation to cancer prevention. American scientists also had a recent study on the effect of fasting on cancer prevention and showed that cancer cells required more food, and so, they were the ones to die first during fasting. Whereas the normal cells could sustain the shock (of fasting), and when food was available to them, they again worked efficiently.

Based on research and the cancer-sugar connection, the best dietary recommendation for those with cancer may be a whole foods, organic diet with includes more fresh, organic vegetables, but less sweet fruit (such as bananas, figs, dates, etc.) as well as eliminating all refined sugars, (such as fructose, sucrose, sorbitol, maltodextrin, etc.) including hidden refined sugars (found in foods not normally associated with containing sugar such as soups, breads, ketchup, etc.). This carefully planned regime may be an enormous help in regulating blood glucose and hence, improving immunity while selectively starving cancer cells.

Glucose - The fuel of cancer cells: Dr. Otto Warburg first discovered that cancer cells have a different energy metabolism compared to healthy cells. He found that malignant tumours frequently exhibit an increase in anaerobic “without air”) glycolysis, an abnormal process whereby glucose is used as a primary fuel by cancer cells and generates large amounts of lactic acid as a by product.

In contrast, normal cells predominantly undergo aerobic (“with air”) cellular metabolism. In cancer, the large increase in lactic acid generated by the cancer cells must be transported to the liver to get metabolized and get clearance. The lactic acid creates a lower, more acidic pH in cancerous tissues as well as overall physical fatigue from liver stress due to overworking to try to clear the lactic acid build-up. Consequently, larger tumours tend to have a more acidic pH. The goal is to return the body to aerobic metabolism as quickly as possible and to achieve an alkaline tissue pH (between 6.4 – 7.0). An alkaline environment is an unfavourable environment for cancer growth. Since, anaerobic glycolysis, is inefficient, extracting only about 5% of the available energy from food supply and from the body’s own calorie stores, the cancer, in effect, is “wasting” energy, so the cancer sufferer eventually becomes tired and undernourished. This vicious cycle increases body wasting – often in a downward spiral until death. This is one reason why almost 40% of

cancer sufferers die from malnutrition (called cachexia or “wasting away”).

Do Glucose intra venues (I. V.) Feed Cancer?

In hospitals, the total parenteral (TPN) solution typically given to cancer patients intravenously provides 70% of the calories going into the bloodstream in the form of glucose. These high-glucose solutions for cachectic cancer patients may be a poor choice of I.V. nutrition and may in effect, be serving to feed the tumour. A more nutritionally balanced I.V. solution with low glucose levels in addition to a broad spectrum of nutrients such as amino acids, vitamins, minerals, lipids and co-factors, may be a much better choice and allow the patient to build strength and would not feed the tumour.

The best way to regulate blood-glucose levels in cancer sufferers may be the following:

- # An optimal whole foods diet
- # 3 top quality nutritional supplements with a broad spectrum of anti-infective, immune supportive phytonutrients
- # Regular exercise and sunlight
- # Gradual weight loss (if overweight) and
- # Stress reduction.

Professional nutritional guidance is crucial for cancer victims. The goal of nutrition therapy is not to eliminate all carbohydrates from the diet but eliminate all refined carbohydrates, and thus, control blood glucose within a narrow range to help starve the cancer and also bolster immune function.

We therefore can say, that we are the only one who changes the circumstances that are slowly destroying us and our children. Although we can provide information, ultimately we are responsible for our health.

The PET scan, a million-dollar positive emission tomography device, is regarded as one of the ultimate cancer-detection tools. PET scans use radioactively-labelled glucose to detect sugar hungry tumour cells. The more glucose that is detected at a site [34] the worse the tumour is becoming. PET scans are used to plot the progress of cancerous tumours and to assess whether present protocols are effective.

A mouse model of human breast cancer demonstrated that tumours are sensitive to blood glucose levels. Mice were injected with an aggressive strain of breast cancer, and then fed diets to induce

one of the following: high blood sugar (hyperglycemia), normal blood sugar or low blood sugar (hypoglycemia). The findings showed that the lower the blood glucose, the greater the survival rate. This suggests that reducing refined sugar intake is a key factor in slowing breast tumour growth. A large-scale epidemiological study of 21 modern countries that track morbidity and mortality (Europe, North America, Japan and others) revealed that sugar intake is a strong risk factor that contributes to higher breast cancer rates, particularly in older women.

In a 4-year research study at the National Institute of Public Health and Environmental Protection in the Netherlands, 111 cancer patients (with cancer of the biliary tract) were compared with 480 controls. Cancer risk associated with the intake of sugars, independent of other energy sources, more than doubled for the cancer patients.

Sugar can produce a significant rise in total cholesterol, triglycerides and bad cholesterol and a decrease in good cholesterol contributing to obesity. Sugar can increase fasting levels of glucose and can cause reactive hypoglycemia. Our body changes sugar into 2 to 5 times more fat in the bloodstream than it does starch. The rapid absorption of sugar promotes excessive food intake and causes high blood pressure in obese people.

Excess sugar could be a causal factor for the development of many problems with the gastrointestinal tract including an acidic digestive tract, indigestion, malabsorption in patients with functional bowel disease, increased risk of Crohn's disease, and ulcerative colitis. Sugar can lead to alcoholism, can cause your saliva to become acidic, tooth decay, and periodontal disease. It is a well established risk factor for dental caries [35]. This observation is based on short-term cohort studies and comparisons of rates of dental caries across countries with wide variations in sugar consumption, although there is a lack of research findings regarding sugar consumption and periodontal disease.

A single most important factor that accelerates aging is insulin, which is triggered by sugar [36]. Sugar can elevate glucose and insulin responses in oral contraceptive users [37]. It can cause a decrease in our insulin sensitivity thereby causing an abnormally high insulin levels and eventually diabetes. Fatty liver disease is caused by the increase in the size of our

liver by making your liver cells divide and increase the amount of fat in our liver. Sugar can cause gallstones, appendicitis, haemorrhoids and damages our pancreas, increase our body's fluid retention. Sugar is enemy of our bowel movement, can compromise the lining of our capillaries.

Sugar can lower your Vitamin E levels, can increase your systolic blood pressure [38], cause drowsiness and decreased activity in children. A high sucrose diet of subjects with peripheral vascular disease significantly increases platelet adhesion and can cause atherosclerosis and cardiovascular disease. Stiff arteries are wreaking havoc on our cardiovascular health. Sugar is a major culprit for hardening protein layers and reducing flexibility in our veins. Sugar can interfere with your absorption of protein [39], causes food allergies, cause toxemia during pregnancy, Fructose is helping to drive up rates of kidney disease. Sugar can make our tendons more brittle. Sugar can contribute to osteoporosis [40].

High sugar consumption by pregnant adolescents can lead to a substantial decrease in gestation duration and is associated with a twofold-increased risk for delivering a small-for-gestational-age (SGA) infant [41]. Sugar if given to premature babies can affect the amount of carbon dioxide they produce. Sugar dehydrates newborns [42], can cause gum disease. In intensive care units, limiting sugar saves lives. Sugar may induce cell death. It should now be crystal clear just how damaging sugar is. You simply cannot achieve your highest degree of health and vitality if you are consuming a significant amount of it. Fortunately, your body has an amazing ability to heal itself when given the basic nutrition it needs, and your liver has an incredible ability to regenerate. If you start making changes today, your health will begin to improve, returning you to the state of vitality.

Fruits are good or bad: Fruit is a key part of a healthy eating plan. Fruits contain many nutrients that body needs. In fact, a healthy diet that includes fruit has been found to reduce the risk of several chronic diseases. But fruit contains natural sugars, and some types are fairly high in calories. But for healthy adults, experts say that eating lots and lots of fruit is unlikely to get you into trouble, as long as it is part of a normal diet [43]. The main concern with overeating fruit is its natural sugar. Since, fruits contain fructose in large quantities, and the metabolic process of fructose is in a much different way than glucose. The entire

burden of metabolizing fructose falls on the liver [44].

People are consuming fructose in enormous quantities, which has made the negative effects much more profound. The average fructose dose is 70 grams per day however; it exceeds the recommend limit by 300 percent because of explosion of soda consumptions. It is important to remember that fructose alone is not evil as fruits are certainly beneficial.

Because high fructose corn syrup (HFCS) is very cheap, so food and beverage manufacturers began switching their sweeteners from sucrose to corn syrup in the 1970s when they discovered that HFCS was not only far cheaper to make, it's about 20 percent sweeter than conventional table sugar that has sucrose. It is added to virtually every processed food. Even if you consumed no soda or fruit, it is very easy to exceed 25 grams of hidden fructose in your diet. Today, 55 percent of sweeteners used in food and beverage manufacturing are made from corn, and the number one source of calories in America is soda, in the form of HFCS.

HFCS contains the same two sugars as sucrose but is more metabolically risky, due to its chemical form. The fructose and the glucose are not bound together in HFCS, as they are in table sugar, so the body does not have to break it down. Therefore, the fructose is absorbed immediately, going straight to your liver. Nevertheless whole fruits also contain vitamins and other antioxidants that reduce the hazardous effects of fructose.

Juices, on the other hand, are nearly as detrimental as soda, because a glass of juice is loaded with fructose, and a lot of the antioxidants are lost. But when you consume high levels of fructose it will absolutely devastate your biochemistry and physiology [45].

Too much fructose creates a metabolic disaster: Dr. Robert Lustig, Professor of Pediatrics in the Division of Endocrinology at the University of California, San Francisco, has been a pioneer in decoding sugar metabolism [46]. His work has highlighted some major differences in how different sugars are broken down and used by the human body.

In fact, heartburn, diarrhea, reflux, and bloating are all potential side effects of eating too much fruit, according to Bruning [47]. High blood sugar is another side effect of fruit consumption, and can be potentially

dangerous for people with diabetes. Nearly every cell in the body utilizes glucose, so it's normally "burned up" immediately after consumption. So where does all of this fructose go, once you consume it? It is turned into fat (VLDL and triglycerides), which means more fat deposits throughout the body.

Eating fructose is far worse than eating fat: Fructose elevates uric acid, which decreases nitric oxide, raises angiotensin, and causes your smooth muscle cells to contract, thereby raising your blood pressure and potentially damaging your kidneys.

Increased uric acid also leads to chronic, low level inflammation, which has far-reaching consequences for your health. For example, chronically inflamed blood vessels lead to heart attacks and strokes; also, a good deal of evidence exists that some cancers are caused by chronic inflammation.

Fructose tricks your body into gaining weight by fooling your metabolism—it turns off your body's appetite control system. Fructose does not appropriately stimulate insulin, which in turn does not suppress ghrelin (the "hunger hormone") and doesn't stimulate leptin (the "satiety hormone"), which together result in your eating more and developing insulin resistance. Fructose rapidly leads to weight gain and abdominal obesity ("beer belly"), decreased HDL, increased LDL, elevated triglycerides, elevated blood sugar, and high blood pressure—i.e., classic metabolic syndrome.

Fructose metabolism is very similar to ethanol metabolism, which has a multitude of toxic effects, including NAFLD (non-alcoholic fatty liver disease). These changes are not seen when humans or animals eat starch (or glucose), suggesting that fructose is a "bad carbohydrate" when consumed in excess of 25 grams per day. It is probably the one factor responsible for the partial success of many "low-carb" diets.

One of the more recent findings that surprised researchers is that glucose actually accelerates fructose absorption, making the potential health risks from HFCS even more profound. Fructose is the number one contributing factor to the current obesity epidemic. So please be careful with your fruit and soda consumption.

If one is a raw food advocate, have a pristine diet,

and exercise very well, then one could be the exception that could exceed this limit and stay healthy. Sugar is not too bad but it depends in how it is packaged. Sugar-containing foods in their natural form, whole fruit, for example, tend to be highly nutritious—nutrient-dense, high in fiber, and low in glycemic load.

Artificial sweeteners: A modifiable cancer risk?: The American Heart Association (AHA) and American Diabetes Association (ADA) have given a cautious nod to the use of artificial sweeteners in place of sugar to combat obesity, metabolic syndrome, diabetes and all risk factors for heart disease. Sucralose (Splenda) is NOT a sugar, despite its sugar-like name and deceptive marketing slogan, “made from sugar.” It’s a chlorinated artificial sweetener in line with aspartame and saccharin, with detrimental health effects to match.

People with higher (above the median) consumption of artificial sweeteners- especially aspartame and acesulfame-potassium (acesulfame-K) - had a 13% higher risk of overall cancer over 8 years than those who did not consume these sweeteners. Higher consumption of aspartame was associated with a 22% increased risk of overall cancer and a 15% increased risk of obesity-related cancer compared with not consuming any of these sweeteners .

“Our findings do not support the use of artificial sweeteners as safe alternatives for sugar in foods or beverages and provide important and novel information to address the controversies about their potential adverse health effect,” Charlotte Debras at the French National Institute for Health and Medical Research and Sorbonne Paris Nord University, France, and colleagues write. “Results from the NutriNet-Santé cohort (n = 102,865) suggest that artificial sweeteners found in many food and beverage brands worldwide may be associated with increased cancer risk, in line with several experimental in vivo/in vitro studies. These findings provide novel information for the re-evaluation of these food additives by health agencies,” they continue [48].

Commenting to the UK Science Media Center, Duane Mellor, PhD, registered dietician and senior teaching fellow, Aston Medical School, Aston University, UK, said: “This study does not prove or even suggest that we should go back to sugar and turn our backs on artificial sweeteners or diet drinks” [49].

It does, however, suggest that artificial sweeteners are not a perfect replacement for sugar, since they come with their own potential risks, as does sugar. The ideal answer is probably to move away from both, however, that may be unappealing to many who like a little sweetness in their life.

“I think that this is an important analysis, but the results need to be interpreted with caution,” another expert, John L. Sievenpiper, Departments of Nutritional Sciences and Medicine, University of Toronto, , Canada, said “Large observational studies like this one that assess the exposure to low and no calorie sweeteners with obesity-related chronic diseases are at risk of reverse causality,” he explained. Reverse causality is a possibility because it is likely that many high consumers of low and no calorie sweeteners (of which aspartame and acesulfame-K are the most common) will be consuming these sweeteners as a weight-loss strategy as opposed to these sweeteners causing obesity and its complications (including cancers).

His team recently published a Diabetes and Nutrition Study Group commissioned systematic review and meta-analysis of 17 randomized controlled trials. Their findings suggest that over the moderate term [low- and no-calorie sweetened beverages] are a viable alternative to water as a replacement strategy in adults with overweight or obesity who are at risk for or have diabetes.

According to Sievenpiper, “is that it is difficult to disentangle the signals for low and no calorie sweeteners from obesity itself and the signals for the sugars and calories that they are replacing/displacing in this analysis. Substitution analyses would be useful to address some of these concerns”[50].

Conflicting results: Recent epidemiologic and animal studies about a possible link between artificial sweeteners and risk of cancer have had conflicting results, and information about specific types of sweeteners and consumption of artificially sweetened foods as well as beverages is lacking [51].

Debras, and his team aimed to investigate the associations between intakes of artificial sweeteners (total and the most common ones aspartame, acesulfame-K, and sucralose) and cancer risk (overall risk and most frequent types breast, prostate, and obesity-related cancers) in the ongoing NutriNet-

Santé study.”Obesity related cancers are cancers for which obesity is involved in their etiology as one of the risk (or protective) factors, as recognized by the World Cancer Research Fund (independently of participant [body mass index] BMI status): colorectal, stomach, liver, mouth, pharynx, larynx, esophageal, breast (with opposite associations pre- and postmenopause), ovarian, endometrial, and prostate cancers,” the researchers explain.

According to a recent study, “obesity increases the risk of breast cancer in postmenopausal women but, conversely, it appears to be protective in premenopausal women,” Sievenpiper noted. The ongoing NutriNet-Santé study was initiated in 2009 to investigate associations between nutrition and health in the French population [52]. Participants aged 18 and older with Internet access enrol voluntarily and self-report medical history and socio-demographic, diet, lifestyle, and health data. The current cohort included 102,865 adults who enrolled in 2009-2021. Consumption of artificial sweeteners was determined from repeated 24-hour dietary records that included brand names of processed foods.

At enrolment, participants were an average age of 42 years and 79% were women. They had a mean BMI of 24 kg/m². On average, they had 5.6 dietary records. Most participants did not consume artificial sweeteners (63%); those who did were classified as lower consumers (18.5%) or higher consumers (18.5%). Aspartame was the most common artificial sweetener (58% of intake), followed by acesulfame-K (29%) and sucralose (10%), and these were mostly in soft drinks (53%), table-top sweeteners (29%), and yogurt/cottage cheese (8%). During a median 7.7 year follow-up, 3358 incident cancers - 982 breast, 403 prostate, and 2023 obesity related cancers - were diagnosed in participants who were a mean age of 60.

Compared with non consumers, higher consumers of artificial sweeteners had a higher risk of overall cancer (hazard ratio [HR], 1.13; 95% CI, 1.03 - 1.25; *P*-trend = .002), after adjusting for age, sex, education, physical activity, smoking, BMI, height, weight gain during follow-up, diabetes, family history of cancer, number of 24-hour dietary records, baseline caloric intake, and consumption of alcohol, sodium, saturated fatty acids, fibre, sugar, fruit and vegetables, whole-grain foods, and dairy products. Participants who were higher consumers of aspartame had an increased risk of overall cancer (HR, 1.15; 95% CI,

1.03 - 1.28; *P* = .002), as did higher consumers of acesulfame-K (HR, 1.13; 95% CI, 1.01 - 1.26; *P* = .007), compared with non consumers, after adjusting for the multiple variables.

Higher consumers of aspartame had a higher risk of breast cancer (HR, 1.22; 95% CI, 1.01 - 1.48; *P* = .036) and obesity-related cancers (HR, 1.15; 95% CI, 1.01 - 1.32; *P* = .026) than non consumers. Higher consumers of total artificial sweeteners had a higher risk of obesity-related cancers than non consumers (HR, 1.13; 95% CI, 1.00 - 1.28; *P* = .036). The researchers acknowledge that study limitations include potential selection bias, residual confounding, and reverse causality, though sensitivity analyses were performed to address these concerns.

Participants in the San Antonio Heart Study who drank more than 21 diet drinks per week were twice as likely to become overweight or obese as people who did not drink diet soda. Ethanol (drinking alcohol) is not a sugar, although beer and wine contain residual sugars and starches, in addition to alcohol. Sugar alcohols like xylitol, glycerol, sorbitol, maltitol, mannitol, and erythritol are neither sugars nor alcohols but are becoming increasingly popular as sweeteners. They are incompletely absorbed from your small intestine, for the most part, so they provide fewer calories than sugar but often cause problems with bloating, diarrhoea and flatulence.

How to cut down on sugar: Added sugars with empty calories are no need for our physiology to go on instead they can pack on the pounds pretty quickly. But it is not hard to cut back on sugar and maybe not even miss it [53]. We may be obviously smart move to reach for cookies, candy, and other sweets less often. But sugar lurks in processed foods, including savoury ones like sauces and dressing to increase the shelf life. Decision to eat more fresh foods and less of packed items is a wise decision.

Be a sugar sleuth: These are few of the names for added sugar. Many food labels will have to list the amount starting in January 2020.

- # Evaporated cane juice
- # Fruit juice concentrate
- # Brown rice syrup, malt syrup, corn syrup, date syrup
- # Barley malt
- # Galactose or glucose [54]

A teaspoon holds 4 grams of sugar. Men should get no more than 9 teaspoons and women no more than 6 teaspoons a day.

Go slow So it's best to cut back in steps. If you usually enjoy coffee with 2 spoonfuls of sugar, try it with 1½. Keep stirring in a bit less and less over time.

Smart swaps for coffee and tea Lemon, licorice, and anise are good flavorings for our tea. For coffee, try cinnamon, vanilla extract, or unsweetened cocoa powder. If you can drink milk, stir some in to add sugar that is natural, but not sweet. Tip: Scan the nutrition information for our favorite coffee-shop beverage to learn which ones are loaded with the sweet stuff.

Rethink Soft Drinks A regular 12-ounce can of soda has 8 teaspoons of sugar so better to swap sodas. Sip on ones with less sugar, artificial sweeteners, or nothing at all to ease our taste buds off sugar over time.

Favour Fruit The sugar found in fruits is a great way to sweeten meals. Sprinkle raisins and chopped dates into salads and grain dishes. Add fruit salsas and chutneys to grilled or roasted meats, poultry, and fish. Mind the fruit portions, since natural sugar is still sugar.

Bring on the heat Grilling or roasting brings out the sweetness in fruits. Add them to desserts or enjoy them all by themselves. Think baked apples, poached pears, grilled pineapple. You can do the same with veggies. Roasted sweet potatoes and carrots are surprisingly sweet, compared to their raw versions. Sautéed onions and fire-roasted red peppers add sweet notes to many savory dishes.

Sub in spices You detect 80% of flavor through your nose. So trick our brain by cutting a quarter of the sugar in non-baking recipes and replacing it with sweet-smelling spices like cinnamon, nutmeg, and vanilla. Spices are good for our body since they are packed with nutrients like calcium, fiber, iron, magnesium, and vitamins like C, K, and A.

Stir in Applesauce Bake with unsweetened applesauce in place of sugar in your muffins, banana bread, and cakes. It adds texture and taste, and no added sugar. Try a 1-to-1 swap to start, and experiment until you hit the right balance. Since applesauce is watery, cut down on liquids in your recipe by about a quarter-cup.

Pick dark chocolate Adore chocolates but just choose dark chocolate. It usually has less sugar and fat than milk or white chocolate. Studies have shown that dark chocolate can keep our heart healthy, too. The higher the cocoa content, the better. So look for dark chocolate that has 70% cocoa or higher. Nibble 1-2 ounces a few times a week for a smarter way to satisfy your sweet tooth [55].

Sugar is harmful for animals too: All animals rely on the bacteria and other microorganisms residing in the gut to help digest the food they eat. A higher dose of sugar to pets can upset the balance of those microorganisms and lead to diarrhoea – sometimes explosive, sometimes bloody, and sometimes even with vomiting [56]. If a dog eats white sugar, it may suffer with ingestion that causes a massive insulin release. The blood-sugar drop (hypoglycemia) that results can cause weakness, stumbling, collapse, and even seizures. But dogs need sugar of some sort. They need carbohydrates which are broken down into sugar or glucose by the body to live and operate. Excessive amounts causes inflammation all throughout the body. From tummy troubles to obesity, here are the reasons your dog should not have sugar. If you want to avoid having to clean up vomit or diarrhoea, it's probably best to avoid giving your dog sugar. In the short term, a sugary treat can lead to an upset stomach. Both chocolate and the artificial sweetener xylitol found in many sugar-free candies—can be toxic to dogs.”Chocolate contains theobromine, a substance that can be poisonous to your pet. Dark, semi-sweet and Baker's chocolate can be lethal if ingested. Dogs cannot digest theobromine as efficiently as humans. Theobromine can be used medically as a diuretic, heart stimulant, blood vessel dilator, and a smooth muscle relaxant. Since dogs cannot process theobromine, excessive amounts of it can cause vomiting, diarrhoea, increased thirst, panting or restlessness, excessive urination, a racing heart rate, muscle spasms and occasionally seizures. Xylitol can cause a life-threatening blood sugar drop or hypoglycaemia and cause rapid liver failure in dogs. Dogs are most often exposed to xylitol when they accidentally eat sugar-free gum or peanut butter that contains it. I recommend that dog owners carefully read the label of all 'sweet' products including tooth paste, cookies and candies, and keep anything containing xylitol out of reach of a curious canine. Another downside of consuming too much sugar is dental caries or cavities. The problem with

sugar is that bacteria in the mouth use it which produces acids. Acids increase the loss of minerals in the enamel or the outer coating of the teeth, leading to dental disease. You cannot avoid sugar – pretty much everything you can put in your dog’s mouth contains some form of sugar to some degree. The best you can do is feed dog foods that are lower in carbohydrates and brush your dog’s teeth. It is also essential that your dog’s teeth be checked at least annually by your veterinarian and that you agree to professional cleanings as recommended by your vet. Refined sugar makes dogs to gain weight, Heart disease, joint problems, lethargy, and difficulty breathing from the additional weight on the chest wall are just a few of the other problems that can result. In general, even if your pet avoids these diseases for a while, quality of life is decreased (less energy, less interest in playing, etc.) when he is overweight. Obesity common in dogs is sadly a growing problem in pets, and it can lead to other harmful conditions linked to other serious conditions including arthritis, heart and respiratory problems and diabetes. Sugar causes increased secretion of insulin, which the body needs to store and use sugar. Insulin has many effects on other hormones in the body, which can change a pet’s muscle tone, fat storage, immune system and energy levels. These changes can lead to weaker, less active and obese pets who are more susceptible to other hormone related diseases, infections and obesity. In the long term, sugar can cause some significant changes to your pet’s body and metabolism – similar to people, the most common challenges. If the dog continues to gain weight, there’s a chance he or she could develop Type II diabetes. Excess sugar leads to excess insulin production which can lead to cells becoming nonreactive to the insulin, which can lead to exhaustion of the insulin producing pancreatic cells resulting in high sugar in the blood [57].

Poultry: So, just like sugar is not necessarily healthy for humans, the same can be said for chickens and other animals too. However, chickens can eat sugar, but only as an occasional treat, and it should be always in its most natural form. Avoid feeding our chickens any sugary treats, sweets, bread, pastries, desserts, etc. Although it is not likely you are going to go ahead and feed your chickens pure sugar, you would be surprised at how much sugar is actually in foods that we commonly feed to chickens, including fruits or vegetables. Too much sugar can have very serious impacts on your chicken’s health and well being. In

fact, too many sugary treats in your chicken’s diet can lead to obesity, lead to overheating or heat exhaustion, and make it difficult for your hens to lay eggs. In low amounts, these impacts are not often seen, but it is still important to be conscious of what sugar can do to your treasured chickens. If chickens consume too much sugar and do not burn off the extra energy they will inevitably gain weight. Overweight chickens are at a higher risk of developing health problems, suffer from heat stress, and due to the various impacts it has, ends up laying fewer eggs. Nonetheless, if you continuously feed them sugary treats your chooks are more likely to become overweight or develop health conditions such as fatty liver hemorrhagic syndrome. However, sugar also dehydrates chickens (but not usually in fatal amounts) but it can lead be a contributing factor to heat exhaustion [58].

Dairy cows: Dietary parameters including starch, soluble fiber, protein B 2 fraction, and forage NDF influence dairy cow response to feeding additional dietary sugar. Higher producing cows have greater responses to dietary sugar. Although there are studies that show a positive response of increasing dietary sugar, overall it does not appear that dietary sugar affects dry matter intake (DMI), milk yield, or milk composition. Interestingly, inclusion of sugar as a partial replacement for starch does not negatively affect ruminal pH which is likely related to an increase lag time in the rapidly fermentable carbohydrate, increased glycogen accumulation by mixed microbes, and increased bicarbonate- dependent Short-chain fatty acids (SCFAs), transport and potentially increased glucose uptake. Benefits of including sugar in diets for lactating cows may be limited to situations where sugar inclusion is cost-competitive on a hexose unit basis with starch.

Carbohydrate fractions and their interactions must be carefully formulated and monitored for diets fed to lactating dairy cows. Feeding additional sugar, regardless of source, between 2% and 5% of the ration DM may result in improved feed efficiency and animal performance. The cost of adding sugar to the diet must be monitored, given that the cost of energy from the sugar may be higher than from starch sources, but animal responses may offset the additional costs. Therefore, monitor income over feed costs when adding such ingredients so that both revenue and cost can be considered [59-61].

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