DIABETES + SUGAR
BY PROF DESI

Not everything sweet is bad for you
Diabetes is the Fastest Growing Disease in the World Today!

According to the Centers for Disease Control:

- Diabetes is an epidemic.
- 17 million Americans have diabetes . . .
  with 5.9 million completely unaware that they even have the disease.
- Diabetes is the 5th leading cause of death in the United States . . .
  with over 200,000 deaths each year from diabetes-related complications.
- Among U.S. adults, diagnosed diabetes increased 49% from 1990 to 2000.
  Similar increases are expected in the next decade and beyond.

What is Diabetes?

In the simplest terms . . . diabetes mellitus (commonly referred to as just "diabetes") is a blood sugar disease . . . a disease in which the body either does not produce or does not properly utilize insulin.

Insulin is a hormone that is needed to convert sugar, starches and other food into energy needed for daily life. Because diabetics have a problem with insulin, their body's can't use glucose (blood sugar) for energy, which results in elevated blood glucose levels (hyperglycemia) and the eventual urination of sugar out of their bodies. As a result . . . diabetics can literally starve themselves to death.

There are three main types of diabetes:

- **Type 1** ("insulin-dependent" and previously called "juvenile diabetes"). Type 1 diabetes is associated with a malfunctioning pancreas which does not produce adequate amounts of insulin. It develops most often in children and young adults. Type 1 diabetes is traditionally treated with insulin.
- **Type 2** ("noninsulin-dependent" or sometomes called "adult-onset diabetes"). Type 2 diabetes is associated with insulin resistant cells. It is much more common and usually develops in older adults. Type 2 diabetes is now being found at younger ages and is even being diagnosed among children and teens.
- **Gestational** (pregnancy-related). Some women develop diabetes during pregnancy usually toward the end of pregnancy. It effects approximately 3 to 5 percent of all pregnant women. Although it goes away after pregnancy, these women have a higher risk for developing type 2 diabetes later in life.

Symptoms of Diabetes

Millions of people have diabetes and don't even know it because the symptoms develop so gradually, people often don't recognize them. Some people, particularly pre-diabetics, have no symptoms at all. Diabetics may have SOME or NONE of the following symptoms:

- Frequent urination
- Excessive thirst
- Extreme hunger
- Unexplained weight loss
- Sudden vision changes
- Tingling or numbness in hands or feet
- Poor circulation
- Poor sleep
- Feeling very tired much of the time
- Irritability
- Very dry skin
- Sores that are slow to heal
- More infections than usual

What causes Diabetes?
There are many causes of diabetes and many types of diabetes. Diabetes happens when the body ability to produce use or regulate insulin is compromised. Then blood sugar does not enter the cells for energy and the blood sugar level climbs in the blood where it destroys tissue. Many reasons for this happening. Insulin is made in the pancreas in the isle of Langerhans cells. But the most prevalent cause is parotitis or mumps virus. As a child mumps comes and if there is inappropriate treatment of the condition then there is a slow degeneration of the Isle of Langerhans cells that develops and when over stress of the pancreas creates a burden and the cells give out. Diabetes ensues. Other viruses, microorganism, and parasites can cause diabetes. (see What's Eating You)

Smoking, stress, heredity, toxins, surgery, nitrates from hot dogs and other processed meats, and excess sugar all are causes and or aggravation to diabetes. Processed meats, carbohydrates and dextrose sugar make the pancreas send out twice to three times more insulin. This burden creates the problem the can lead to diabetes.

Radiation is another factor. There is too much free ionizing radiation from radioactive fallout, accidents, and uranium set free in the atmosphere and it causes destruction of cells and can destroy the Isle of Langerhans. Bad diet, bad oils, toxins, bad sugars, lack of exercise, coffee right after meals all can contribute. Once these cells are destroyed and deregulated it is difficult and perhaps impossible to rejuvenate them. This book is about learning to treat the problem.

**Type 1 Diabetes**

Interspersed evenly throughout the pancreas, is a very specialized tissue, containing cells which make and secrete hormones. This tissue, called the "Islets of Langerhans" is named after the German pathologist Paul Langerhans, who discovered them in 1869. Through a microscope, Langerhans observed these cells cluster in groups, which he likened to little islands in the pancreas.

One such group of cells, the beta cells, produce insulin in response to blood glucose. These beta cells are tiny insulin factories that sense the level of glucose in the blood stream, and produce insulin in precise proportion to that level. Therefore, following a meal, blood sugar levels will rise significantly, and the beta cells will release a large amount of insulin. This insulin will cause body cells to take up the sugar, causing blood sugar to quickly return to its normal range. Once blood sugar is in the normal range, the beta cells will reduce the output
of insulin to an idling state. In this way, the beta cells adjust their production of insulin on a minute-by-minute basis, always producing just enough insulin to deal with the amount of blood sugar presently in the blood stream.

In type 1 diabetes, the islets are destroyed by the person's own immune system, which mistakenly identifies these essential cells as foreign invaders. This self-destructive mechanism is the basis of many so-called autoimmune diseases. Once the islets are killed, the ability to produce insulin is lost, and the overt symptoms and consequences of diabetes begin.

**Type 2 Diabetes**

The most common causes of type 2 diabetes are poor diet and/or lack of exercise, both of which can result in insulin resistance . . . a condition where the cells in our bodies aren't sensitive enough to react to the insulin produced by our pancreas.

Recent research suggests that the root cause of insulin resistance is a breakdown in intercellular signaling. Insulin is a chemical messenger. It signals proteins called GLUT-4 transporters (residing within the cell) to rise up to the cell's membrane, where they can grab on to glucose and take it inside the cell. In patients with insulin resistance, the cells don't get the message. They simply can't hear insulin "knocking" on the door, which results in elevated blood levels of both insulin and glucose.
In the early stages of insulin resistance, the pancreas compensates by producing more and more insulin, and so the "knocking" becomes louder and louder. The message is eventually "heard", enabling glucose transportation into the cells, resulting in the eventual normalization of blood glucose levels. This is known as "compensated insulin resistance".

Over time, the stress of excessive insulin production wears out the pancreas and it cannot keep up this accelerated output. As a result, glucose levels remain elevated for prolonged periods. This is called "uncompensated insulin resistance" and is the essence of advanced type 2 diabetes.

Type 2 Diabetes

1. The stomach changes food into glucose.
2. Glucose enters the bloodstream.
3. The pancreas makes insulin.
4. Insulin enters the bloodstream.
5. Glucose can't get into the cells of the body. Glucose builds up in the blood vessels.

Type 2 diabetes is characterized by a series of chain reactions:

1. The ingestion of too many carbohydrates leads to a spike in blood sugar levels.
2. This is followed by a corresponding rise in insulin.
3. This in turn causes blood sugar to drop.
4. Eventually, this drastic up-and-down activity begins to take its toll on the body's ability to use insulin and thus metabolize sugar.
5. Over time, the pancreas "wears out" and can no longer pump out enough insulin to overcome this insulin resistance.
6. This results in a decreased insulin production and/or increased insulin resistance which propagates the cycle and leads to the onset of diabetes.

It is not known if obesity causes insulin resistance; or if insulin resistance causes obesity; or if they develop independently. We do know that insulin resistance is correlated to obesity . . . particularly the type where your weight collects around your middle (like an apple). We also know that physical inactivity contributes to insulin resistance, as does eating too much dietary carbohydrate.
Diabetes and Oxidative Stress

Most researchers are in basic agreement that the theory of oxidative stress is central to explaining the cause of diabetes. To understand the theory, one must first conceptualize that a "free radical" is any atom or molecule which has an "unpaired electron" in it’s outer ring. Because it is lacking an electron, it is unstable and very much wants to find one electron to fill its need. This "free radical" will steal an electron from any other molecule it encounters that is more willing to give one up . . . and thus it becomes satisfied . . . but now the victim molecule has become a free radical itself and so it now will look for another victim molecule to steal it's much desired electron from . . . thus propagating this cycle over and over again. This cycle is called "the chain reaction of free radicals".

The chief danger of free radicals comes from the damage they can do when they react with important cellular components such as DNA, or the cell membrane. Cells may function poorly or die if this occurs.
To prevent free radical damage the body has a defense system of antioxidants. Antioxidants are molecules which can safely interact with free radicals and terminate the chain reaction before vital molecules are damaged. Although there are several enzyme systems within the body that scavenge free radicals, the principle antioxidants are: glutathione, SOD (superoxide dismutase), beta carotene, vitamin E, vitamin C, CoQ10, melatonin, and alpha lipoic acid.

According to the theory of oxidative stress, free radicals run rampant through the body reeking havoc. In the case of type 1 diabetes . . . damaging beta cells in the pancreas, negatively impacting their ability to produce insulin . . . in the case if type 2 diabetes . . . damaging cell membranes, leading to a breakdown in intercellular signaling.

And if that were not bad enough . . . free radicals deplete our body's reserve of antioxidants . . . further contributing to the problem.

This is why it is so important to lower the oxidative stress with better diet, more exercise, improved lifestyle; and to take all the antioxidant supplements known to neutralize the excess free radicals.
There is still a lot to learn about the causes of diabetes, but what is known, is that our bodies may begin to malfunction five to seven years before we are ever diagnosed with diabetes. That is why researchers believe that nearly 30-50% of the people who have diabetes don't even know it.

It is vital for the person with diabetes to measure his blood sugar and get to KNOW not GUESS about his body. He needs to know how stress affects him, how carbs affect him, and how everything affects his blood sugar. Knowledge is power. Sometimes we find that just certain foods, just certain stresses just certain times of the month make the diabetes work.
Risk Factors for Diabetes

The two major factors contributing to today’s alarming rise in diabetes are: poor diet and lack of exercise. In today's fast paced culture, with its emphasis on "fast foods", and it's de-emphasis on exercise, more and more of us are eating unhealthy diets and choosing poor lifestyles.

Our typical diet has become way out of balance. We eat way too many simple sugars, way too often. Most people consume candy, french fries, potato chips, ice cream, pasta etc on a regular basis. We eat twice the calories we need, twice the protein we need, and each year the average person consumes over 160 pounds of sugars and sweeteners we don't need at all.

When you consider that so many of us are overfed and so few of us get any regular exercise. . . and then add to that . . . the fact that many of us overuse alcohol and nicotine which increases oxidative stress. . . it's no wonder that millions of us already suffer from diabetes, or are at great risk of developing diabetes in the near future.
The ever increasing number of overweight, out of shape, oxidatively stressed people in today’s societies around the world, is directly proportional to the epidemic rise of diabetes.

The following is a list of risk factors for getting diabetes:

- Being more than 20% overweight
- Physical inactivity
- Having a first degree relative with diabetes (parents or siblings)
- Belonging to any of the following ethnic groups: African American, Native American, Latin American, Asian American, Pacific Islander
- Having an "Impaired Fasting Glucose" (IFG) or "Impaired Glucose Tolerance" (IGF) on previous blood tests.
- Having Triglycerides (blood fats) which are more than 250 mg/dl
- Having HDL cholesterol ("good" cholesterol) which is less than 35 mg/dl
- Having a history of hypertension (high blood pressure)
- Having a history of gestational (pregnancy-related) diabetes or giving birth to a baby which weighed more than 9 pounds

Complications of Diabetes

The most important health impacts of diabetes are the long-term complications it can cause. Most of these long-term complications are related to the adverse effects diabetes has on arteries and nerves.
Complications related to artery damage

Diabetes causes damage to both large and small arteries. This artery damage results in medical problems that are both common and serious:

- **Cardiovascular disease.** Diabetics have up to a 400% greater chance of heart attack or stroke. Heart disease and stroke cause about 65% of deaths among people with diabetes. These deaths could be reduced by 30% with improved care to control blood pressure and blood glucose and lipid levels.

- **Amputations.** About 82,000 people have diabetes-related leg and foot amputations each year. Over 60% of non-traumatic lower limb amputations are diabetes related. Foot care programs that include regular examinations and patient education could prevent up to 85% of these amputations.

- **Kidney disease.** About 38,000 people with diabetes develop kidney failure each year. Treatment to better control blood pressure and blood glucose levels could reduce diabetes-related kidney failure by about 50%.
Eye disease and blindness. Each year, 12,000-24,000 people become blind because of diabetic eye disease, including diabetic retinopathy. Diabetes is the leading cause of new cases of blindness among adults 20-74 years old. Screening and care could prevent up to 90% of diabetes-related blindness.

Sexual Dysfunction. Approximately 70% of all adult males with diabetes currently suffer or will experience sexual dysfunction or impotence.

Complications related to nerve damage

60 to 70% of people with diabetes have mild to severe forms of nervous system damage. This diabetic neuropathy may result in numbness, tingling, and paresthesias in the extremities and, less often, debilitating, severe, deep-seated pain and hyperesthesias. The following are examples of diabetic neuropathy

- **Peripheral neuropathy** The feet and legs can develop tingling, pain, or a loss of feeling. This problem makes foot ulcers and foot infections more common, adding to the possibility that an amputation may be needed.
- **Stomach and bowel problems** The nerves that trigger normal movements of the stomach and intestines can become less active or less predictable. This can result in nausea, constipation or diarrhea. A stomach that is slow to empty has a diabetes condition called gastroparesis.
- **Dizziness when standing** Your circulation has to make some adjustments to move blood from your toes to your torso when you are standing up, since it is pumping against gravity. When your body is working correctly, this adjustment includes tightening of blood vessels to prevent pooling of blood in your lower body. The circulation relies on nerve signals to know when to make this adjustment. These signals can fail in diabetes, leaving you with low blood pressure and lightheadedness when you are standing.
- **Sexual-function problems** Impotence is especially common in people with nerve damage from diabetes. Artery damage also contributes to impotence.
- **Localized nerve failures** A nerve that controls a single muscle can lose its function. Examples of problems that might result are eye movement problems with double vision, or drooping of the cheek on one side of the head (commonly known as Bell's palsy).

Other Complications

- **Flu- and pneumonia-related deaths.** Each year, 10,000-30,000 people with diabetes die of complications from flu or pneumonia. They are roughly three times more likely to die of these complications than people without diabetes.
- **Pregnancy complications.** About 18,000 women with preexisting diabetes deliver babies each year, and an estimated 135,000 expectant mothers are diagnosed with gestational diabetes. These women and their babies have an increased risk for serious complications.

Many of these potential complications can significantly shorten the life of a person with diabetes, and all of them can diminish the quality of life.

**Diabetes complications are primarily caused by 2 factors:**

*Excessive Glycosylation and Sorbitol Accumulation.*
Excessive Glycosylation

- Glycosylation is the process by which the sugar molecule binds irreversibly to a protein molecule. This process takes place in all humans, but because diabetics have higher levels of glucose in their blood and for longer durations than non diabetics, they have a much higher degree of glycosylation occurring.
- Excessive glycosylation results in abnormal protein structures which lead to a host of cellular dysfunctions such as: inactivation of enzymes, inhibition of regulatory molecule binding, decreased susceptibility to proteolysis, abnormalities of nucleic acid function, altered macromolecular recognitions and increased immunogenicity.
- In diabetics, glucose binds to proteins in the blood, nerves and the eyes. This pathological process causes much of the damage in the complications of diabetes.

Sorbitol Accumulation

- Sorbitol is the byproduct of glucose metabolism and is produced through the action of the enzyme aldose reductase.
- In non-diabetics, sorbitol is converted to fructose and is easily excreted from the cell, but inside the cells of diabetics, when glucose levels become elevated (even after glucose levels outside of the cell return to normal), sorbitol is produced faster than it can be broken down. Since it cannot cross the cell membrane, it builds up to a toxic level inside the cells, creating an imbalance and causing a loss of electrolytes and other minerals. This accumulated sorbitol draws water in to the cell, by the process known as osmosis, and ultimately leads to the collapse of its architecture and loss of its function.
- Sorbitol-induced osmotic swelling is believed to be one of the main causes of tissue damage in diabetics. This condition seems to target organs and tissues that are not dependent on insulin for their absorption of glucose. Elevations of sorbitol levels are a major problem in peripheral nerves, blood vessels, the cells of the retinal blood vessels, the lens of the eye, the pancreas, kidneys and other organs due to their lack of insulin dependence.

How Is Diabetes Diagnosed?

Diabetes is diagnosed by evaluating both symptoms and lab test results.

There are two common lab tests:

1. **Fasting Plasma Glucose test (FPG):** With the FPG test, your blood glucose level is measured after an 8 hour fast. If your glucose is higher than normal (100 mg/dl), you have what's called "Impaired Fasting Glucose" (IFG), which suggests pre-diabetes. A diagnosis of Diabetes is made when an FPG level of greater than 125 mg/dl is measured on two occasions.
2. **Oral Glucose Tolerance Test (OGTT):** An OGTT may be helpful in diagnosing type 2 Diabetes in patients whose FPG is between 115 and 125 mg/dl. During an OGTT test, your blood sugar is measured after a fast and then again 2 hours after drinking a beverage containing a large amount of glucose. Two hours after the drink, if your glucose is higher than normal (140 mg/dl), you have what's called "Impaired Glucose Tolerance" (IGF), which suggests pre-diabetes. A diagnosis of Diabetes is made when an OGTT level is greater than 200 mg/dl
Alternative Natural Treatments

Diabetes and its complications can be treated and/or prevented safely without prescription drugs. If you have diabetes or any of the risk factors for diabetes or are just concerned about diabetes, you should start now with a natural treatment plan to reduce your risk.

There are 3 components to a natural diabetes cure:
1. **Diet**: The single most important change any diabetic or person at risk can make is to improve their diet. A proper diabetic diet should have a low glycemic index . . . which means containing low simple carbohydrates, moderate protein and high fiber. This diabetic diet will reduce blood sugar, reduce insulin levels, and reduce the need for medications. It will also help to reduce weight, reduce blood pressure and support overall health and energy.

2. **Exercise**: Many studies have shown that exercise is of great benefit to diabetics and can significantly reduce the risk of developing type 2 diabetes. Regular physical activity helps reduce weight, lower blood sugar, improve insulin sensitivity, strengthen the immune system, improve circulation, lower blood pressure, lower LDL ("bad") cholesterol, raise HDL ("good") cholesterol, and reduce risk of heart disease.

3. **Nutritional Supplements**: There are a number of nutritional supplements that every diabetic should be taking on a daily basis. These supplements are very effective in helping to lower blood sugar and insulin levels, reduce cholesterol levels, reduce triglyceride levels, reduce blood pressure, improve energy, and reduce the risk of heart disease.

   These supplements can also protect your tissues (eyes, kidneys, blood vessels) from the damage diabetes often causes. They can also support your immune system, protect your heart, and improve circulation.

   The effectiveness of these supplements is not at all theoretical, but rather is fact. There are thousands of published studies proving the beneficial effects these supplements have on diabetics. Amazingly enough, despite the overwhelming evidence, most M.D.’s do not recommend nutritional supplements to their diabetic patients. Fortunately, a prescription is not required.

   If you have diabetes . . . supplementation is more than important . . . it is vital!

   Every diabetic should take these proven supplements: Cinnamon, Alpha Lipoic Acid, Chromax®, Vanadium, Banaba Leaf, Momordica, Gymnema Sylvestre and Fenugreek
Diabetes Daily Care® is unique, because it contains ALL of these vital nutrients TOGETHER in a 100% vegetable capsule!

Cinnamon

Cinnamon is the brown bark of the cinnamon tree, which when dried, rolls into a tubular form known as a quill. It is available in either its whole quill form (cinnamon sticks) or as ground powder. Cinnamon is one of the oldest spices known.

It turns out that cinnamon is much more than just a spice . . . it has demonstrated great medical application in preventing and combating diabetes. According to cellular and molecular studies conducted at the University of California, Santa Barbara, Iowa State University and the U.S. Department of Agriculture . . . Cinnamon plays the role of an insulin substitute in type II diabetes.

This initial discovery was made quite accidentally, by Richard Anderson at the US Department of Agriculture's Human Nutrition Research Center in Beltsville, Maryland.

"We were looking at the effects of common foods on blood sugar," he told New Scientist. One was the American favourite, apple pie, which is usually spiced with cinnamon. "We expected it to be bad. But it helped," he says.

Anderson's team found that people who eat apple pie have a significantly lower probability of getting Type II diabetes. Upon further examination, he isolated cinnamon as the substance in the apple pies that was preventing the diabetes.

They recently completed a human study with associates in Pakistan using cinnamon. Their study included 60 Pakistani volunteers (30 men and 30 women ranging in age from 44 to 58 years) with type 2 diabetes, who were not taking insulin. Subjects were divided into six groups. For 40 days, groups 1, 2 and 3 were given 1, 3 or 6 grams of cinnamon per day, while groups 4, 5 and 6 received placebo capsules.
The results were quite remarkable:

- All three of the groups given cinnamon showed reduced blood sugar levels.
- Collectively, all three levels of cinnamon resulted in:
  o reduced blood sugar levels by by 18-29%,
  o reduction of triglycerides by 23-30%,
  o reduced LDL cholesterol by 7-27%,
  o reduced total cholesterol by12-26%.
- Even the group with the lowest amount of cinnamon (1 gram per day), produced an approximately 20% drop in blood sugar.
- When daily cinnamon was stopped, blood sugar levels began to increase.
- No significant changes were seen in those groups receiving placebo.

The researchers' concluded: "Including cinnamon in the diet of people with type 2 diabetes will reduce risk factors associated with diabetes and cardiovascular diseases."

"I don't recommend eating more cinnamon buns, or even more apple pie . . . there's too much fat and sugar," says Anderson."The key is to add cinnamon to what you would eat normally."

- Cinnamon triples insulin's efficiency
- at least 1/2 teaspoon is critical to "soften" the cell membranes.

Further studies by the Anderson team have corroborated cinnamon's ability to improve insulin activity; and have led to the discovery of cinnamon's active ingredient; as well as an understanding of it's structure, and the mechanism by which it enhances insulin activity.

Using nuclear magnetic resonance and mass spectroscopy, the Anderson team was able to describe the chemical structure of a molecule with "insulin-like" activity in cinnamon, as a water-soluble polyphenol compound called methylhydroxychalcone polymer (MHCP).

Dr. Anderson discovered that MHCP not only stimulates glucose uptake by our cells, but it can even help in the synthesis of glycogen, a polymer of glucose that our bodies produce as a means of storing energy for later use, when it is depolymerized back to glucose. Producing adequate amounts of glycogen is a principal function of blood sugar metabolism, and MHCP can help. Anderson notes . . . "The chemical is very easily obtained." One of his colleagues tried soaking a cinnamon stick in tea. "He isn't diabetic . . . but it lowered his blood sugar."

The Anderson team was awarded patents related to MHCP in 2002.

In their latest paper, published in the Journal of Agricultural and Food Chemistry, Anderson et al. conclude that MHCP mimics insulin, has effects similar to that of insulin and works almost as well as insulin. He asserts that both of these substances work by chemically modifying our cells' insulin receptors in a manner that activates them to do their job, which is to allow glucose molecules to pass through the cell wall into the insulin cascade. He also discovered that when MHCP and insulin act together, the effect is synergistic, i.e., the total effect is greater than the sum of its parts." They characterize the insulin-enhancing complexes in cinnamon as "a collection of catechin/epicatechin oligomers that increase the body's insulin-dependent ability to use glucose roughly 20-fold".

Don Graves of UCSB (a former professor of Anderson) has focused his studies on the way cinnamon operates at cellular and molecular levels, looking at how it works with the cell's
insulin receptor and other proteins involved in the action of insulin. Both test tube and animal studies have shown that compounds in cinnamon not only stimulate insulin receptors, but also inhibit an enzyme that inactivates them, thus significantly increasing cells' ability to use glucose.

Additionally, Graves found that cinnamon is a very powerful antioxidant with the ability to neutralize free radicals, often elevated in diabetics, helping to minimize oxidative stress which plays such a big role in the disease. In fact, when compared to six other antioxidant spices (anise, ginger, licorice, mint, nutmeg and vanilla) and three chemical food preservatives (BHA (butylated hydroxyanisole), BHT (butylated hydroxytoluene), and propyl gallate), cinnamon prevented oxidation more effectively than all the other spices (except mint) and more effectively then any of the chemical antioxidants.

Some scientists had been concerned about potentially toxic effects of regularly consuming cinnamon. The latest research shows that the potentially toxic compounds in cinnamon bark are found primarily in the lipid (fat) soluble fractions and are present only at very low levels in water soluble cinnamon extracts, which are the ones with the insulin-enhancing compounds.

**Alpha Lipoic Acid**

Alpha Lipoic Acid (also known as thioctic acid or lipoic acid), is a very powerful, natural antioxidant; and is the single most important supplement you can take to treat diabetes. Alpha Lipoic Acid (ALA) is a medium length, disulfide fatty acid. In other words . . . it is an 8 carbon, fatty acid, containing two sulfur atoms. It occurs naturally in our bodies, but not in the free form. The body actually converts Alpha Lipoic Acid (ALA) to DiHydro Lipoc Acid (DHLA).

ALA was first isolated in 1953 and was quickly discovered to be a very important cofactor in the Krebs cycle (the body's main process for converting carbohydrates into energy). ALA and its cousin DHLA are often referred to as the "ultimate universal antioxidants". They (referred to collectively as LA) are the only antioxidants that are both fat and water soluble. Both can actually cross the blood/brain barrier to enter the brain. These unique qualities are important, because it means that LA can access all parts of all cells, giving it tremendous ability to scavenge free radicals wherever they may be. Additionally, LA can also recharge other antioxidants that have been used up. In the body, LA helps regenerate other antioxidants such as vitamin C, vitamin E and glutathione. And, because LA functions much like a B-vitamin, it also helps convert food into energy.

Although the body makes some alpha lipoic acid, it is not enough for optimal nutrition. Likewise, there are only very small amounts of ALA found in some of our daily foods such as broccoli, potatoes, and liver. In these foods, it actually occurs as lipolylysine though, and not actual lipoic acid itself. You'll never get any useful amount of ALA from your diet alone . . . broccoli (one of the best food sources), for example, contains a mere 100 micrograms per 100 gram serving. This means you would have to eat over two pounds of broccoli to get one single milligram of lipolylysine to convert into alpha lipoic acid.

Everyone over the age of forty (diabetic or not) should be supplementing with 200 mg/day of ALA, for its powerful antioxidant properties. Supplementation is the only way to get this vital nutrient in your body. if you are diabetic . . . you simply must take ALA daily . . . there is a mountain of evidence supporting the major benefits it provides all diabetics.
The journal BioFactors (volume 10, 1999) published a study conducted at the Eberhard-Karls University in Germany titled "Thioctic Acid-Effects on Insulin Sensitivity and Glucose-Metabolism". In their study, real adult human diabetics were given various doses of ALA. The doctors found that in just 10 days, ALA helped cure insulin resistance, normalize blood sugar levels and cure diabetes.

The researchers pointed out that "Thioctic acid is a co-factor of key mitochondrial enzymes, involved in the regulation of glucose oxidation, such as the pyruvate dehydrogenase and the alpha-ketoglutarate dehydrogenase, both enzyme complexes which are known to be diminished in diabetes." In plain words, this means ALA works with our bodies' enzymes to prevent glucose from being oxidized. They concluded "The clinical and experimental data indicate that this compound has beneficial effects on insulin sensitivity, correcting several metabolic pathways known to be altered in type 2 diabetes, such as insulin stimulated glucose uptake, glucose oxidation and glycogen synthesis." The authors quote two human studies published in Diabetologia 1995 and Arzneimittelschung 1995. "Here insulin sensitivity was increased 27 to 51% in merely 10 days!"

This is nothing less than incredible! Keep in mind . . . these are real human studies, conducted at a major university, with 39 citations and with no funding from anyone. Results like this are far more than any pharmaceutical drug, anywhere on earth, at any cost . . . could even begin to approach.

Other studies have shown that ALA Increases glucose effectiveness. When ingested, ALA decreases serum lactate and pyruvate concentrations improving glucose effectiveness in both lean and obese patients with type 2 diabetes. Additionally, because ALA inhibits glycosylation and peroxidation of nervous tissues and increases the levels of intra-cellular glutathione, it has been used to improve diabetic nerve damage and reduce pain associated with that nerve damage.

Nerve damage or neuropathy effects over 50% of diabetics and is one of its most damaging complications. A study published in "Diabetes Care" has shown that supplementing with ALA can partly restore diabetic nerve function after only four months of high-dose oral treatment. In 2001, Nutrition 17 published a study which was conducted at the University of Southern California, titled "Molecular Aspects of Lipoic Acid in the Prevention of Diabetes Complications". The researchers concluded "Available data strongly suggest that ALA, because of its antioxidant properties, is particularly suited to the prevention and/or treatment of diabetic complications . . . In addition, ALA increases glucose uptake . . . increases glucose disposal in type 2 diabetics and markedly reduces the symptoms of diabetic pathologies, including cataract formation, vascular damage and polyneuropathy". These are rather powerful statements coming from very well respected research groups.

Chromium and Vanadium are two very important minerals for diabetics.

Chromium can actually help insulin transport sugar to the cells. It works to make insulin more effective by "bridging" insulin to cell membranes, thus increasing the number of active insulin receptors, resulting in increased insulin sensitivity.

The trace mineral chromium is found in skin, fat, muscle, brain and adrenal glands. There is only about 6 mg in you, but it is ever so important! Chromium absorption through the small intestine is very poor; so normally, a lot of it gets excreted in urine. People with diabetes excrete even more chromium than healthy people; and the loss of this vital nutrient makes
it harder for their bodies to respond to insulin. Studies show that chromium supplements can help both Type 1 and Type 2 diabetics control their blood sugar.

There are various forms of chromium suitable for human ingestion. The picolinate form of chromium called "chromium picolinate" is the most absorbable. It is a unique molecule that combines chromium with picolinic acid, a compound found in breast milk, which helps the body better absorb and process minerals.

In June of 2002, Chromax® (the "Nutrition 21" patented brand of chromium picolinate) was affirmed by the FDA as "Generally Recognized as Safe" (GRAS) for use in food products, one of only a handful of ingredients to have secured this status at clinically effective doses for use in foods marketed for weight loss and glucose control. In addition, Chromax®; has demonstrated that it is significantly more bioactive than other forms of chromium.

Vandium (vanadyl sulfate) is a trace element that exhibits a variety of significant insulin-mimetic properties . . . actually doing the job of insulin and transporting sugar to the cells.

Clinical trials indicate that "in vitro", vanadium salts have most of the same major effects of insulin on insulin-sensitive tissues. Favorable results are seen, as well, in animal models of insulin deficiency, where vanadium significantly reduces blood glucose levels, and in insulin-resistant diabetic animals, where vanadium improves glucose homeostasis.

In "in vivo" animal studies, examining the relationship between hyperinsulinemia, insulin resistance and hypertension, vanadium compounds produce significant, sustained decreases in both plasma insulin concentration and blood pressure. Restoring plasma insulin levels reversed the blood-pressure effect.

Clinical trials with vanadium compounds have produced benefits in both type 1 and type 2 diabetic patients. Results have been better, however, in type 2 patients. Six type 2 diabetic subjects treated with 100 milligrams of vanadyl sulfate daily for four weeks had significant reductions in fasting plasma glucose; beneficial effects on insulin sensitivity persisted for up to four weeks after vanadium treatment ended.

**Banaba Leaf**

Banaba (Lagerstroemia speciosa) is a plant native to India, Southeast Asia and the Philippines and has several medicinal uses. In many cultures the banaba leaf is brewed into a tea and used as a treatment for diabetes and as a weigh loss aid. Banaba Leaf Extract provides a blood sugar lowering effect similar to that of insulin in that it induces glucose transport from the blood into body cells.

Recently, researchers have isolated an active ingredient in the banaba leaf called corosolic acid which was originally thought to be "the" blood sugar regulating substance in the leaf. Other researchers have found that corosolic acid may not be the only active ingredient in banaba leaves. A study published in the journal Planta Medica in 2001 compared a whole-leaf extract of banaba with insulin in cell cultures. The researchers concluded that the whole herb has a glucose lowering effect. Another study reported that banaba leaf extract contains at least three active ingredients that effect blood sugar.

In animal studies, administration of banaba leaf extract resulted in a significant decrease of blood glucose. The same studies suggest that corosolic acid may stimulate glucose transport into tissue. In other animal studies, administration of banaba leaf extract resulted in
reduced weight gain, reduced triglyceride accumulation and reduced adipose tissue, with no changes in diet. In noninsulin-dependent animals, administration of banaba leaf extract resulted in suppressed blood plasma glucose, lower serum insulin and lower urinary excretion of glucose.

In clinical studies conducted by Dr William Judy and associates at the Southeastern Institute of Biomedical Research in Bradenton, Florida, a one per cent corosolic acid extract of banaba leaf reportedly reduced serum glucose 20-30% in people with type 2 diabetes, but did not reduce serum glucose in healthy individuals.

In a prior study, some of the same researchers observed that individuals receiving the corosolic acid extract also had an increased tendency toward weight loss . . . an average of about 3.2 pounds.

**Momordica**

Bitter melon is the common name for Momordica charantia, also known as African cucumber, balsam pear and bitter gourd. The plant is aptly named, as all parts of the plant, including the fruit, taste bitter. Widely sold in Asian groceries as a vegetable, bitter melon is employed as a folk remedy primarily for regulating blood sugar in cases of diabetes, as well as for colitis and dysentery, intestinal worms, jaundice and fevers. Current understanding of the phytochemicals in bitter melon suggests that these multiple uses are well founded.

Among the constituents in bitter melon, charantin is identified as a primary agent for blood-sugar regulation. Charantin demonstrates hypoglycaemic (blood sugar lowering) or other actions of potential benefit in diabetes. The fruits also contain insulin-like peptides, including one known as polypeptide P, and alkaloids. It is likely that several substances in bitter melon contribute to its blood sugar-modifying effects. In human studies, bitter melon demonstrates significant blood-sugar control after food intake and overall blood sugar-lowering effects.

In a study published in the journal Chemistry & Biology - March 2008, a research team, headed by Dr. Mon-Jia Tan of the Chinese Academy of Sciences in Shanghai, concluded that bitter melon has potent anti-diabetes effects. In their study, Tan and colleagues isolated and described several compounds from bitter melon known as cucurbitane triterpenoids, and tested their effects on glucose (sugar) and fat metabolism in cells and in mice. When tested in muscle and fat cells, the researchers found, the compounds stimulated the glucose receptor GLUT4 to move from the cell interior to the cell surface, thus promoting more effective glucose metabolism. Several of the tested compounds had effects comparable to those of insulin. Tests in mice of two of the compounds found that they promoted both glucose tolerance and fat burning, and one was particularly effective in promoting glucose tolerance in animals consuming high fat diets.

The researchers note that there may be as many as 70 active compounds in bitter melon. "The present study provides an important basis for further analysis of structure-activity relationship to develop optimized leads from (bitter melon) for the treatment of insulin resistance and obesity," they conclude.

Momordica has also been found to be just as effective as glibenclamide in reducing blood sugar levels (J Ethnopharmacol 2003; 88(1): 107-111). In fact, a large study at Harvard University Medical School concluded that mormodica is one of the best natural remedies for diabetes (Diabetes Care 2003; 26(4): 1277-1294). It appears that mormodica contains
compounds similar in structure to insulin, which have the same effects in regulating blood sugar levels. There is also evidence that moromdica can prevent the release of excess glucose into the bloodstream from the liver (Am J Health Syst Pharm 2003; 60(4): 356-359).

**Gymnema Sylvestre**

Gymnema Sylvestre is another herb, whose traditional use in treating diabetes, has been backed up by recent medical research. Originating from India, Gymnema Sylvestre is known as gur-mar, or "sugar destroyer." When gymnema leaf is placed directly on the tongue, it eliminates the sensation of sweetness, even if sugar is put in the mouth immediately following. When taken internally, it helps to control blood-sugar levels in diabetes.

The leaves of Gymnema sylvestre perform two significant functions relative to diabetes. First, they suppress blood glucose, especially after eating. Secondly, they are insulinotropic and promote insulin secretion. By this two-pronged approach, Gymnema sylvestre proves a valuable aid in diabetes control.

Scientists think its active ingredients (gymnemic acids) protect the cells of the pancreas from free radical damage, so allowing them to regenerate and produce insulin more effectively (Nutrition 2004; 20(3): 280-285). Studies have shown that gymnema can also reduce glucose absorption from the intestine, so helping to regulate blood sugar levels. A recent Harvard study indicates the Gymnema lowers blood sugar levels in Type 1 and Type 2 diabetics. A recent King's College, London, study states that Gymnema acts by increasing cell permeability, therefore reducing insulin resistance.

**Fenugreek**

Fenugreek (Trigonella foenum-graecum) is a tall annual herb that is native to the Mediterranean, Ukraine, India and China. The plant bears pods filled with numerous light brown, diamond-shaped seeds that possess a sweet maple aroma and are commonly used in cookery and flavouring.

Studies reveal that fenugreek helps regulate blood glucose. The glucose-regulating, antidiabetic properties of fenugreek seed are linked to a novel free amino acid, 4-hydroxyisoleucine. This compound stimulates insulin secretion, thereby limiting the extent to which blood glucose is elevated; by promoting insulin secretion and inhibiting the rise of blood glucose, it helps stabilise blood sugar and reduces body fat production. In one human study, 15g/day fenugreek significantly reduced glucose levels after meals. Today fenugreek shows value as an antidiabetic agent with potential for weight control due to its 4-hydroxyisoleucine content. Some supplements are capsules of powdered seed, while others are more concentrated extracts standardized to 4-hydroxyisoleucine.

Experimental and clinical studies have demonstrated the antidiabetic properties of fenugreek seeds. The active ingredient responsible for the antidiabetic properties of fenugreek is in the defatted portion of the seed that contains the alkaloid trogonelline, nicotinic acid and coumarin. Fenugreek contains six compounds that help regulate blood sugar levels. Modern research shows that fenugreek seeds not only lower blood glucose but reduce insulin levels, total cholesterol and triglycerides, while increasing HDL (the good cholesterol).
Diabetes Daily Care® uses all Natural Ingredients to Safely and Effectively Improve Glucose Metabolism.

There are other natural diabetes treatment formulas out in the market place today, but there is is none that combines the proven effectiveness of Alpha Lipoic Acid, Chromax® and Vanadium together with the extracts of Cinnamon Bark, Banaba Leaf, Fenugreek, Gymnema Sylvestre and Momordica. None that contain such generous amounts of each ingredient. None that contain plant extracts that are both standardized and of such high potency extraction ratios. In short there is no other natural diabetes treatment out there that compares to the quality and value of Diabetes Daily Care®.

The vast majority of people who use Diabetes Daily Care® experience substantially reduced blood glucose levels. Most are able to cut back on or totally eliminate the use of prescription drugs with the blessings of their medical doctor. Most experience great improvement in many of the complications that are generally associated with diabetes. Many have reported increased eye sight, better sleep, more energy, better circulation and improved weight management. Many men have also reported increased or restored sexual function.

It is very important to note that, because Diabetes Daily Care® may have significantly positive effects on your blood glucose levels, your medication needs may change and so your blood sugar and medication levels should be closely monitored. Even if your doctor does not know about or believe in natural alternative treatments, he should be informed of any changes you make in the management of your disease.

(Sulfonylurea drugs)

**Many modern prescription diabetes drugs (Sulfonylurea drugs) also stimulate insulin secretion from the pancreas. However, these drugs are only effective when beta cells maintain their basic function of insulin secretion. It is also reported that long-term usage of Sulfonylurea drugs cause serious side-effects. Long-term, they cause a decreased amount of insulin production by putting too much strain on the beta cells. Since the body eventually becomes resistant to these drugs, they lose their effectiveness and dosages will continuously need to be increased. On average, after seven years of usage, these agents no longer work and new drugs will then be given. Most type 2 diabetics will then be forced to rely on insulin injections as their beta cells are too damaged to produce any insulin.

Another serious side-effect of Sulfonylurea drugs is that they often over-stimulate the pancreas and produce too much insulin. As insulin removes sugar or glucose from the bloodstream, it can result in hypoglycemia, or low blood sugar. This can be more dangerous than high blood sugar, leading to shakiness, confusion, coma and death. Other complications such as renal disease also exist.

Helpful herbs and vegetables for Diabetes

1. Bitter Gourd (Karela): Bitter gourd Momordica-charantia or bitter melon juice contains plant insulin and should be taken 2 ounce 2 times daily on an empty stomach. It is found to be very effective for diabetes. Or It can be cooked as any vegetable and eaten. Or The bitter melon powder can be made
by drying. Take bitter gourd powder 1 teaspoon daily in empty stomach.

2. Taking half a teaspoon of cinnamon a day may help prevent the onset of diabetes. Even soaking a cinnamon sticks in your tea, could also benefit non-diabetics who have blood sugar problem but are unaware of it.

3. 30 gram fenugreek seeds can be soaked in a glass of water at night and after 12 hours take it and grind it into a paste with the soaked water and drink it on a empty stomach. Or 2 teaspoon if powdered seeds can be taken with water or milk. Or You can add fenugreek into anything you cook.

4. Eating upto 3 grapefruits a day has also been helpful.

5. 1 tablespoon of amla (Emblica officinalis) after removing the seeds extract the juice and mix with a cup of bitter gourd juice and take daily for 2months in a empty stomach.

6. Gymnema Sylvestre a traditional ayurvedic herb the leaf of which is to be taken up to 4 grams per day.

7. Indian blackberry seeds or Jamun seed powder (scientific name of Jamun is Eugenia jambolana or Syzygium cumini L and) is very good for diabetes. Take 1/4th teaspoon with 1 teaspoon honey for 50 days.

8. Eating freshly crushed raw garlic 3-4 grams a day lowers blood sugar. You can wash it down with a
glass of water.


10. Bael (Aegle marmelos) : The leave of the bael tree when chewed are very useful in diabetes. Pulp of this fruit could be dried and taken in doses of 5 to 10 gms a day.

11. A pinch of pure turmeric powders mixed in amla juice (Indian gooseberry) and eat daily in empty stomach.

12. Use of turmeric and gooseberry in equal quantities in powder form taken with warm water is very useful in this behalf. These activate the pancreatic cells and more insulin is produced.

13. Wild jeerakam cumin seeds black colored 60 gm in 1 liter and boil a reduce it ti 1/4th liter and take half divide it into two equal parts and drink one part in the morning and one in the evening 2 times daily.

14. Grind (Bacopa monnieri) Bhrahmi and add a teaspoon of it to milk and drink

**Mango for Prostate**

According to scientists at the Industrial Toxicology Research Centre (ITRC), mango pulp may provide an effective non-invasive method of treating prostrate cancer.

After administering mango pulp to mice affected with cancer, scientists, investigating the healing properties of the fruit, noticed that the tumor in the mice was radically suppressed.

The scientists believe that a chemical compound found in mango called “lupeol” is the reason for the suppression of tumor cells in the mice.

Scientist Yogeshwar Shukla points out that while blocking cancer cells from growing, lupeol also has anti-carcinogenic properties that fight well against other health disorders. He said that certain compounds such as organic acids, specific vitamins, carbohydrates, and polyphenols, which are present in lupeol, give it the strength to fight off numerous health disorders.

ITRC scientists state that it is very difficult to detect prostrate cancer because it has the most subtle malignant cells. They said that India has seen an enormous increase of prostrate cancer patients lately, but neither radiation therapy, chemotherapy nor surgery has proven successful in treating the disease. As a result, the scientists felt the need for research in this area which started them on their study on lupeol and its relationship with prostrate cancer.

Scientists have found that lupeol has demonstrated various medicinal properties. Experiments have revealed that lupeol shows signs of strong anti-inflammatory, anti-arthritic, anti-diabetic, and anti-malarial properties.
Because of the success rate with mango pulp extract (http://buydominica.com/vitalsource), scientists believe that this fruit will provide a way in which cancer can be treated naturally within the coming years. Although there are several traditional treatments for cancer, many of them have harsh side effects, according to scientists. With their studies on mango pulp extract, Shukla said it will definitely open a better and safer way for treating cancer. Currently, scientists have observed medicinal properties of lupeol in certain types of mangoes only. However, scientists will soon begin to study lupeol medicinal properties in nearly all kinds of mangoes that are found in Uttar Pradesh. Shukla assures us that just as mangoes from his state have earned a worldwide reputation, he and his team will be studying nearly all varieties of mangoes in future experiments that concerns mango pulp extract.

**Ten Foods and Herbs That Will Help You Beat Diabetes**

What does pumpkin soup, Ital stew and oats porridge with cinnamon have in common? The answer is that they seem to have properties that can help to control and even beat the diabetes epidemic through natural cure for diabetes herbs. But before you begin to excite your taste buds with these foods, it would be wise to first get rid of the foods that contribute to diabetes. This may be hard for you, but you've got to immediately clear your pantry and refrigerator of sodas, high fructose juices and snacks, sugar, white rice, white flour, white bread and pasta etc.

The foods mentioned quickly flood your blood stream with an unprecedented amount of sugar that put a lot of strain on the pancreas - the maker of insulin that removes sugar from the blood stream. If you do not control this flood of sugar via your diet, the pancreas will eventually short circuit and produce less or even stop secreting insulin. Uncontrolled diabetes leads to other complication including kidney disease, heart disease, glaucoma, gangrene and a host of other conditions.

Now let's fast forward to the good news. By exercising, losing the extra weight and eating the following foods you can actually help prevent, control or even beat diabetes the natural way:

**Pumpkin**

Research conducted on pumpkin shows that it contains compounds that help to prevent the destruction of and regeneration of damaged pancreatic cells. As a result, pumpkin also helps to increase insulin levels in the blood. The protective effect of pumpkin is thought to be due to both antioxidants and molecules that mediate insulin activity. So keep on eating your pumpkin and drinking your pumpkins soup.

**Ital Stew**
An ital stew made with peas, okra, pumpkin, carrots, cho cho and stewed down with coconut milk and served with brown rice provides fiber, mucilage and a wide variety of nutrients that will slow sugar absorption into the blood stream and regulate insulin response.

**Cherries, Cinnamon and Buckwheat**
Researches have identified antioxidants, beneficial compounds and fiber cherries, cinnamons and buckwheat respectively that can help to lower blood sugar levels. Cherries contain a group of antioxidants that help increase insulin production, and up to half a teaspoon of cinnamon powder on food for forty day show blood suger lowering capabilities.

**Green Tea**
Five cups of black or green tea per day research says could significantly reduce cataract formation. Black, green and oolong teas could also increase insulin activity. Add lemon and please, no sugar!

**Coconut oil**
It is believed that coconut oil puts less of a demand on the enzyme production of the pancreas. This lessens the stress on the pancreas during mealtime when insulin is produced most heavily, thus allowing the organ to function more efficiently. According to the Journal of the Indian Medical Association, coconut oil in the diet enhances insulin action and improves binding affinity compared to other oils.

**American Ginseng**
Researchers at St. Michael’s Hospital and the University of Toronto have found that taking American
ginseng before a meal reduces blood sugar in people both with and without diabetes

Logwood Bark

This is a long time tradition remedy for diabetes. Boil 1 ounce logwood chips in a pint of distilled water for 10 minutes. Add 2 teaspoon near end. Drink 1-2 ounces daily.

Bitters

Bitters such as Dr. Bush Bitters help to clear excessive sugars from the blood stream. It also stimulates pancreatic and digestive secretion.

A Natural Cure for Diabetes
Here we have more powerful proof that the trace elements provide a natural cure for diabetes - and many other diseases. In this article, chromium supplementation has been found to provide dramatic improvement - up to and including freedom from all symptoms - in diabetes. However, in another direction of research initiated by Prof. John McNeill at UBC, the trace element vanadium had been found to provide just as dramatic improvements.

This proves and underscores my assertion that not only one or two trace elements, but the complete natural range of the 72+ trace elements is needed for our naturally robust health. Of course, neither chromium nor vanadium are recognized by our modern agriculture, and are therefore either severely deficient or absent in agricultural soils, hence in all of their products, and hence again, in practically all of our daily food. And as asserted here in these pages, a daily serving of seafood is a natural source of the complete range of the 72+ trace elements, and will provide not only the same, but far, far better results than either chromium or vanadium alone.

Another good nutritional source of chromium is whole grain flour, and all its products, such as whole grain bread, buns, cereal, cookies and pastries. Already deficient in soils, whatever chromium is left in flour is lost in the 'refining' process to white flour. Exactly the same holds true for white sugar. Use only brown sugar and molasses where ever you can.

Original Article:

Supplementation with Chromium Picolinate:
Therapeutic for Diabetes and Pre-Diabetes Patients

Supplementation with a form of the trace mineral chromium called chromium picolinate is prudent nutritional therapy for your patients with diabetes and pre-diabetes.

To give you an overview of why I say this, most of the studies involving supplemental chromium for type II diabetes have shown positive results of one type or another. However, when chromium picolinate, which is the most bioavailable form, has been used, all of the studies have yielded positive results (in blood sugar, blood insulin and/or blood lipid [cholesterol and triglyceride] readings).[i]

One of these studies, a 1997 study involving 180 type II diabetes patients in China, is a classic: it documented “spectacular” results in diabetes patients who took 500 mcg chromium picolinate twice daily. After four months, nearly all of the diabetes patients no longer had traditional signs of diabetes. Their blood sugar and insulin levels dropped to near normal—something that
medications could not achieve. Even more importantly, the "gold standard" diagnostic measure of diabetes—blood levels of hemoglobin A1c (sugar-damaged proteins that age cells)—also dropped to normal.[iii]

A follow-up study by some of the same researchers monitored 833 type II diabetes patients who took 500 mcg chromium picolinate twice daily: a significant reduction in fasting blood sugar levels and in post-meal blood sugar levels was found during the ten months of the study. No negative side effects were shown from taking the supplements. In addition, more than 85 percent of the patients reported improvements in the common diabetic symptoms of excessive thirst, frequent urination and fatigue.[iii]

Although the incidence of type II diabetes is increasing in record numbers, many people don’t yet have diabetes but are at high risk for developing it. Chromium supplements can help in these cases, too. A study directed by William Cefalu, M.D., of Wake Forest University, monitored individuals at risk—people who were moderately obese and had a family history of diabetes. Some people received a placebo; others, 1,000 mcg of chromium picolinate daily. After four months of treatment with chromium, insulin resistance was reduced by 40 percent.[iv] Chromium supplements, therefore, help reverse the underlying disease process that leads to type II diabetes. In other words, they help both prevent and reverse Type II diabetes.

**Chromium picolinate's benefits for other types of diabetes patients.**
Many diabetes patients who inject insulin—both type I diabetes patients, and type II diabetes patients who are in more advanced stages of the disease—respond positively to chromium picolinate supplementation. About 70 percent of both types of diabetes patients show improved insulin responsiveness after taking 200 mcg supplemental chromium per day. Some experience such improved insulin sensitivity that they are able to reduce the amount of insulin they inject or the amount of other blood-sugar-lowering medications they take.[v]

Chromium supplementation has been found helpful for still other types of diabetes. Gestational diabetes is a transitional diabetes that develops during pregnancy and can cause numerous health problems, including loss of the child. It's the most common medical complication of pregnancy today. According to one study, just eight weeks of supplementation with chromium picolinate can significantly improve glucose intolerance and reduce blood sugar and insulin levels in those with gestational diabetes, thereby reducing the risk of health trouble for both mother and child.[vi]

The use of certain pharmaceutical drugs, such as corticosteroids or Thiazide diuretics, lead to significant chromium losses and can also sometimes induce diabetes-like conditions. Fortunately, chromium supplementation can lead to improvements in the body’s handling of blood sugar in both cases. In one study, steroid-induced diabetes was ameliorated in 38 of 41 patients following supplementation of 200 mcg of chromium three times per day. This occurred even though blood-sugar-lowering drugs were reduced 50 percent in all patients who were given chromium supplements.[vii]

**Basics about Chromium and Supplementation Dosages.**
Although researchers still don’t know exactly how chromium does its magic, chromium helps insulin work more efficiently to allow blood glucose to move from the blood into the cells. The Recommended Daily Allowance Committee recommends 50-200 mcg of chromium per day. This amount seems reasonable for the average healthy person, but higher amounts are needed for people with conditions involving insulin resistance, such as type II diabetes and pre-diabetes. Type II diabetes patients who have taken chromium picolinate in low doses—200 mcg per day—have had some improvement in their condition; however, they have not the same spectacular results as type II diabetes patients who have taken 1,000 mcg per day.

Unfortunately, the vast majority of Americans doesn't obtain even the minimum 50 mcg of
chromium from their daily diets. Research from the USDA found that men average 33 mcg of chromium per day in their diets and women average 25 mcg per day.[viii] Even diets, designed to be well balanced by nutritionists, almost always contain less than 50 mcg of chromium.[ix]

The amount of chromium that people need varies. It depends primarily on their intake from foods and their state of health. Those who are most lacking in the nutrient need it the most.[x] It's also important to understand that type II diabetes patients have altered chromium metabolism—greater excretion of chromium, lower tissue levels of chromium, and less of an ability to convert chromium into a usable form in the body.

In animal experiments, chromium has demonstrated a lack of toxicity at extremely high levels—levels several thousand times the estimated safe and adequate daily dietary intake (ESADDI) limit of 200 mcg per day. There is no evidence of toxic effects related to chromium supplementation in chromium supplementation in humans or animals.

For all of these reasons, some think supplementation with chromium picolinate is a must to try with diabetes patients. It’s a prudent, safe, well-tested nutritional approach that more often than not will offer your patients impressive benefits in their condition and their symptoms.

**4 Magic Foods For You to Lower Blood Sugar**

**Posted Feb 26 2010 8:44am**

Be sure, there are foods to lower blood sugar while you are prone to diabetes; diabetic or pre-diabetic. Diabetes is treated by many with prescription medications following a timely diagnosis by a physician. It is also true many people do not know or they don’t have faith that plenty of locally available natural foods serve the best to reduce blood sugars accumulated in the circulation system. If you are worried about what you are fighting All Day Long with diabetes you can be benefited by consuming the following magic foods to slash down the spiking blood sugar in the blood stream.

**French beans**

These are nothing but kidney beans. If they are cooked with proper cookery adds you may relish the delicious taste. They contain high percentage of protein as well as rich fiber. In addition to these they contain a good amount of complex carbohydrates that are needed for healthy body building. With this angle, it is strongly recommended by health professionals that French beans are the best food source to eliminate blood sugars.

**Brussels sprouts**

It is recommended by most of the dietitians that the juice of Brussels sprout can help triggering your insulin production. The juice can be taken with an equal volume of juice of French beans for better effect in lowering blood sugar levels.

**Lettuce**

Lettuce as a green vegetable has gained popularity among Americans following the certification of American Diabetes Association. It has got star recognition as one best diabetic diet food containing low cholesterol and low fats. It is projected among the diabetics as the best food to include the potential to lower blood sugar levels. It is a plus that the lettuce contains a bare minimum of carbohydrates.

**Tomatoes**

It is great that tomatoes that are used in daily cookery contribute to certain extent to lose body weight. Tomatoes can be eaten in raw as salad, and it is claimed that recipes without tomatoes cuttings are waste and losing taste. Here our concern is the medicinal component that the tomatoes constitute the cheap and best delicious food to control blood sugar levels.

Do you feel that the above gifts of Nature are good diabetic foods or diabetic medicines? Indeed, these are the double barreled rifles to shoot down the sugar levels in the blood stream. They are double barreled in the sense that they serve as kitchen mates as well as naturopathic medicines to help reducing blood sugar to keep off diabetes.
Gestational Diabetes Diagnosed at Lower Blood Glucose Levels
Posted Feb 26 2010 4:10am
A new international study involving 23,000 women in nine countries suggests that more than twice as many mothers to be as previously thought will develop gestational diabetes. This finding is based on new measurements for determining dangerous blood sugar levels for the mother and her unborn baby. Previous guidelines to diagnose gestational diabetes were based on blood sugar levels that identified women at high risk for developing diabetes in the future. The guidelines weren't related to risks to the baby or other risks to the mother. According to the new study coordinated by investigators at Northwestern University Feinberg School of Medicine, a fasting blood sugar level of 92 or higher, a one-hour level of 180 or higher on a glucose tolerance test or a two-hour level of 153 or higher on a glucose tolerance test constitute serious risks to the mother and baby. Previously, these levels had been considered in the safe, normal range, and two elevated levels were required for a diagnosis of gestational diabetes.

Complications of gestational diabetes include overweight babies with high insulin levels, early deliveries, cesarean section deliveries and potentially life-threatening preeclampsia, a condition in which the mother has high blood pressure that affects her and the baby. Women with mild gestational diabetes, however, who are treated with lifestyle and diet changes as well as blood sugar monitoring, greatly reduce their risk of complications.

The study, which demonstrated more than 16 percent of the entire population of pregnant women qualified as having gestational diabetes, will be published in the March issue of Diabetes Care, a journal of the American Diabetes Association.

The natural way to control diabetes

My grandmother loved candy. Growing up, she was always good for a chocolate bar or a mouthful of toffee when the need arose. Even though she ate all that candy my grandmother was also very healthy with the exception of being mildly diabetic. She attributed her good health to 'bush.' No, not the George W. variety. "Bush" is Caribbean speak for herbs grown in your garden or found in the wild. She was particularly fond of a bush that she simply called 'bitters'. Trust me when I say this stuff was bitter! She would buy this stuff, boil it in water, let it cool and then make us kids drink it under pain of being cut off from our candy supplier. We drank it.

In 1999, a Bangladeshi clinical trial was conducted to examine the effect of Momordica charantia on 100 patients with Non-Insulin Dependent Diabetes Mellitus (NIDDM) or Type 2 Diabetes. The researchers recorded the patients' sugar levels both without food intake for 12-24 hours and after taking 75g of glucose. They then administered a bitter melon pulp suspension to diabetic patients and 86 out of the 100 responded to the vegetable intake, showing a significant 14% reduction in fasting and post-meal serum glucose levels. Several rat and hamster trials taking bitter melon have also yielded very positive results in regulating glucose levels.

A more up to date study conducted in India at the Ahilya University in 2004 gave similar positive results. Fifteen men and women with Type 2 diabetes between the ages of 52 and 65 took 200mg extracted constituents of bitter melon together with half doses of Metformin and Glibencamamide or a combination of both. The result was a blood glucose level lower than what patients may acquire from taking full doses of Metformin or Glibencamamide.
Diabetes Control Herbs

Turmeric

The available information on turmeric is widespread, and compelling. It is a traditional treatment specifically for diabetes, and many sources cite studies that have shown positive results for lowering blood sugar.

I found references frequently to Ayurvedic medicine, which may or may not recommend itself to you as a valid point in its favor. It is said to act on blood sugar levels both in increasing metabolism and stimulating insulin. It is high in chromium, which may count for part of that affect.

Turmeric is a common spice, and is used in cooking, sometimes as a cheap alternative to saffron, and sometimes in pickles and other common uses. It is yellow, and looks a lot like ground mustard.

Information on safety of this herb is also lacking, possibly because safety is assumed because of its widespread use as a spice. But there is a huge difference between using something in the minute quantities of a seasoning, and using it in larger doses as a medicinal supplement.

Proceed with caution if this is something you want to try, and do a little more research on its use and safety.
St. John's Wort

I have included this here not because it primarily affects blood sugar, but because depression often occurs as a result of diabetes, or becomes a complicating factor in it. It is very hard to control your diet when you are feeling discouraged and hopeless, the temptation to eat certain things can be nearly overwhelming. So this is included because it is an herb I have experience with, and a condition I have had to cope with many times.

St. John’s Wort is a somewhat controversial herb, but its value has been studied widely in Europe, where it is routinely prescribed for depression. It can conflict with a range of medications, so you need to do some more research before you use it, to make sure it will not affect the function of other medications you are on.

It can also make you VERY sensitive to sunlight. I got a sunburn while using it, from spending the day sitting in the SHADE. There was enough reflected light around to burn me even though I spent no more than a total of 3 minutes in direct sunlight.

It is not generally considered to be safe during pregnancy, which is why I don’t use it right now - I am experiencing a bit of winter depression and would use it if it were not for a desire to have another baby.
I did not have any other side effects from using it, other than sunburns. It did relieve a portion of my depression, using two tablets a day (I don’t remember the strength). I got no abnormal feeling from it, I just felt a little better, and was able to cope better.

I found that for me, it worked better when used with Borage Oil. The combination just helped to lift some of the discouragement and frustration that I get with depression. Some people use it with Gingko also, which can have a synergistic effect for people who experience more confusion or forgetfulness with depression. I don’t use Gingko though because it is another supplement that gives me migraines.

Depression comes in two forms: Clinical, which is caused by chemical or hormonal influences, and Situational, which is caused by emotional responses to situations in your life. A diagnosis of diabetes alone is enough to bring on depression in some people, and if your disease is rapidly progressing, or requires major adaptations, it can make it worse, or it can become ongoing. Diabetes can also cause changes to brain chemistry over time, which can aggravate depression. Further, if you have other situations in your life, or pre-existing depression, you can experience depression from another source which in turn affects your diabetes control.

One of the major aspects of diabetes care is being consistent. This is much harder when you are feeling like the small things really don’t matter anyway, or when your emotional state is causing you to crave something in inappropriate amounts. Cravings for chocolate, fats, salt, sugar, breads, ice cream, etc, are common when someone feels down and discouraged. It is hard to resist an intense craving, and it may make it very difficult to control your diet. Mental confusion and forgetfulness may also interfere with medication doses, monitoring, and other routine aspects of care. Conversely, getting on top of the depression can make the entire process of managing diabetes much easier to accomplish.

This supplement can be very valuable for many people, but for others it can be hazardous, so be very careful, talk to your doctor, read up on the interactions, and then proceed with care if it is something that you feel you need.

- Canadian Diabetes Association: Clinical Practice Guidelines
- Books on Diabetes
- Common causes and home remedies: Laryngitis
Red Rooibos tea

Red Rooibos

Antioxidant polyphenols (the same elements as contained in green tea) without the caffeine. Red Rooibos tea not only appears to not have some of the negative affects of green tea, but it contains higher quantities of the things that are prized in green tea.

It has a long history in South Africa, where it is grown. It has long been used for soothing, healing, and prevention of disease.

This tea reputedly has a naturally sweet taste. For diabetics, that alone is a powerful benefit, since it completely avoids the issue of sugar or artificial sweeteners. It is used iced, or hot, and won't keep you up late if you use it at night. I find that the flavor is not really all that sweet, but it does only take a single packet of Stevia to sweeten a very large mug (20 oz).

This tea is also non-addictive - it does not contain the addictive elements that green tea has. Safety during pregnancy or nursing is not known!

I have found some sources that indicate that it may directly influence blood sugar levels, others just cite it as a diabetes support supplement, because it can help slow down cell damage, and help get the rest of your body functioning as well as possible.

Either way, it appears that it may be a safer bet than green tea, and a way to get the benefits of the nutrients without the nasty side effects that green tea can have.

I have used this tea, both in combination with peppermint (to help with a sinus headache), and as a warm drink in the evening when I needed to relax. I have not noticed any ill effects, but it is a tea I feel safe using during pregnancy, and for my kids - this is just my own personal feeling on it, and my own choice.
Neem Leaf

Along with cinnamon and bitter melon, neem leaf is one of the herbs which has multiple studies citing effectiveness for lowering blood sugar levels. A quick search online shows multiple mention of its use in other countries as a treatment for diabetes, after approval by governments for that purpose.

Neem leaf is not only cited as lowering blood sugar, but also for improving circulation, which may also be an issue with diabetics.

Now, the thing that seems to be prevalent in herbal medicine, is that the herbs that DO work to lower blood sugar are also the more risky ones to use. They have lower tolerances before they become toxic, and care is needed in administration. I could not find easily accessible information about the safety of neem leaf, nor could I find any info on whether it was safe for infants, or in pregnancy or for breastfeeding women.

Because I cannot find information on its safety (I am sure it exists, it just was not where I was looking), I cannot make any kind of recommendation other than extreme caution if this herb is used. In countries where it is approved for diabetes treatment, it can be used under a doctor’s care. In countries where it is not recognized, it may be difficult to persuade a doctor to assist you in the monitoring that is needed to safely use it.

The evidence of its efficacy is quite a bit more persuasive than with many other herbs, but you’ll need to do more research and make a decision for yourself.
Natural Diabetes Cure: Lower Blood sugar 20% in Two Weeks

Moringa Leaf

Moringa Leaf

Moringa is an herb that has been used in Africa as a nutritional supplement to treat and prevent malnourishment. It is routinely administered to people of all ages including infants.

There have been studies done, in which the leaf powder lowered blood sugar after administration. If you search online for Moringa in association with diabetes, the references are plentiful, but many of them are produced by herbal supplement companies, so their reliability is suspect.

This is a supplement I had never heard of until doing some research through articles on diabetes. It is gaining popularity though, and it is not hard to find references to it.

The references to diabetes in association with it are direct, not abstract, but they range from outright claims of studies, to "suspected" references. And while the herb is listed in many sources as being safe, no studies have been done to validate that claim.

It is high in a wide range of nutrients and trace elements, so the affects are varied.

Use it with caution, keep your doctor informed, and monitor your sugars carefully.
Green tea has been heralded in the last few years as the latest miracle herb. In fact, it is not that, it is not the only herb with the benefits that it provides, and it has a nasty backlash that other options do not have.

Because several cultures use tea as a recreational drink, and indeed, part of the very fabric of their lives, it is promoted wholesale as a safe and healthy drink. No one will criticize it, because it is much more lucrative (as it always has been), to promote the drink as something people should have more of, not less. It is long associated with social status, and for centuries, tea and money were so closely entwined that tea had its own value equivalent to currency. We still have associations in society regarding tea that have nothing to do with the drink itself.

Green tea is high in antioxidants of a particular type, and as such, it is recommended for a wide variety of purposes. It also contains two chemicals which may be helpful in lowering blood sugar. Interestingly enough though, the information I found referred only to studies done on the two chemicals, NOT to studies involving tea directly. Whether green tea lowers blood sugar or not may be a highly individual thing.

Tea also contains a high amount of stimulants. Stimulants have their own set of risks, and while they can temporarily convey a sense of energy, they do not in fact speed up the metabolism - rather, you get a temporary boost, then a drop. It is also addictive, partly due to the caffeine in it, but also due to other substances. This means that over time, like coffee, the stimulant effect wears off, and you need it just to function, and no longer gain anything from it.
The list of cautions for green tea is very long. It is potentially dangerous to pregnant or breastfeeding mothers - it can cause uterine contractions, and it does carry over to the baby through breastfeeding.

Green tea interacts with a huge number of medications, in multiple categories. Sometimes it increases the effect, sometimes it decreases it. Of special note is that it should not ever be used by those who are on chemotherapy, because it can increase or decrease the effectiveness of those medications, leading to an increased risk of reoccurrence, or potential toxicity from the drugs. It also interacts with many heart medications.

Considering that a balanced diet, combined with intelligent supplementation with your choice of a wide range of other foods or supplements could do the same thing as green tea, it is not something that is worth getting addicted to, in my opinion. Red Rooibos tea, mangosteen or acai fruit, or any other high antioxidant food or supplement would be a far better bet, with fewer potential side effects.

Grapeseed Extract

Grapeseed extract is a bit harder to find than some other supplements, and may be fairly expensive through some sources. It is high in components that have an anti-oxidant effect, and is considered one of the best sources of the elements it contains.

It has been shown in studies to support healthy collagen and elastin, which are important to tissue health. It improves the usage of vitamin C in your body, and is considered to help offset the affects of aging.

There are preliminary suggestions that grapeseed extract may be helpful for varicose veins, heart disease, and diabetes, but I cannot find evidence to support those claims. Given the category in which this extract falls though, it is reasonable to suppose that it SHOULD positively affect those conditions. It is also reasonable to suppose that it might be beneficial in slowing pancreatic deterioration in certain circumstances.

This is a supplement which I intend to try, but since I am currently adding several others to my diet, one at a time, it will be several weeks before I am able to do so. It is important to point out that this is an herbal compound, not a single nutrient supplement, so it has multiple nutrients. It may affect more than just one system, and may have stronger negative affects as well, so proceed with caution if you choose to use it. Grapeseed extract is sometimes used as a natural preservative in natural or organic cosmetic products.
This is another hotbed of controversy. Many sources say that goldenseal must not be used by diabetics. Others say it can be a useful herb in controlling diabetes. And there is a reason for both statements.

Goldenseal has been known for ages to reduce blood sugar. But it does it very abruptly, and fairly strongly. It is an herb which also has other affects on the body, so it certainly is not appropriate for everyone, diabetic or not. In herbal lore though, warnings about it dropping blood sugar levels are given to people who are not diabetic also, so the evidence that it does do that is fairly conclusive.

The reason warnings exist against use by diabetics is that it can cause severe hypoglycemia. If you are prone to that anyway, it could endanger your life. It is not an herb which should even be experimented with by brittle diabetics, and is likely less applicable to Type I diabetics than to Type II if used therapeutically. It should always be used under advisement from a health care professional.

The key to its use would seem to be control. I could find no instructions anywhere on appropriate dosage, when to take it, or what to expect if you did. This is an herb which I feel might be helpful for me to test, but only if I am sure that I am not pregnant at the time.

The information available seems to suggest that it would need to be taken on a meal-by-meal basis. But whether it would need to be taken before the meal, with the meal, or just after the meal is unclear. It is theorized that it causes the body to either use insulin more efficiently, or to release more insulin. Either way, the reaction is described as quick and significant.
Extreme caution is advised with this herb! Very low initial doses, and close monitoring (testing at 1 hour, 1 1/2 hour, and 2 hours postprandial instead of just at 2 hours) would be required until a predictable result could be determined, as well as being prepared with emergency glucose if required. **Even at that, there may be significant risk if you have problems with hypoglycemia at any point.**

The one other common warning with Goldenseal is that it is thought to be a blood thinner, so people with clotting disorders should avoid its use, or consult a physician about it.

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**Exotic Herbs**

There are a range of herbs from all over the world which have had preliminary and mostly informal testing done for diabetes control. I have not tried any of them because they all have significant risks, dosages must be carefully controlled to avoid toxicity in many of them, and quality of available supplements is not consistent.

For me, since I desire to have another baby, the risks of these herbs is simply too great. If I were not trying to conceive though, I might be willing to test some of them myself.

Here are a few of the common ones:

**Gymnema Sylvestre**

Used for centuries to help maintain healthy blood sugar levels, this herb is often mentioned in conjunction with blood sugar control. There is some preliminary suggestions that it may be successful in regenerating the pancreas beta cells in lab rats. It is a common ingredient in blood sugar control herbal preparations.

**Pterocarpus Marsupium**

Some sources suggest it may help rejuvenate the insulin-producing pancreatic beta cells. It’s value in lowering blood sugar has been studied many times.

**Bitter Melon**
At least three compounds in Bitter Melon have been reported to have sugar-regulating properties. It is traditionally used in Asia for blood sugar control.

**Ginseng**

A common herb which is often included in "energy" blends. Recent studies have shown that Ginseng may be helpful in reducing blood sugar levels in Type II diabetic patients. Siberian ginseng does not seem to have useful properties for blood sugar control. This herb builds up rapidly in a person, and may cause severe headaches, and low energy levels if overused, and overusing it is NOT all that difficult. Even low levels on a daily basis can be too much for many people.

**Holy Basil**

Human trials of the leaves of this herb suggest that it may be useful in helping to lower blood sugar levels in Type II diabetes.

**Swertia Chirayita**

A rare herb, studies on efficacy are hard to find, but it has been compared by one study to standard drugs for Type II diabetes.

Others that I have seen mentioned in relation to diabetes management are:

- gotu kola
- goats rue
- eugenia jambulana
- bael tree
- goji berry
- ganoderma

**Remember, most of these have not been formally studied in controlled settings, or in any comparative settings where placebos were used in for control groups.** And some of them have highly toxic side effects if they are overused - tolerance levels may be very low. I do not have enough first hand knowledge of any of them to make any kind of recommendation for use, or for safety.

If you choose to try any of them, do so cautiously, and study the available sources on dosage before you do so. **Some may be relatively safe, others far more dangerous than diabetes.**
Echinacea purpurea Maxima

Echinacea

Echinacea

It has nothing to do with blood sugar. Rather, the long term affects of diabetes.

Echinacea is an herb with a long history. It is a root, from a daisy like plant, and has to be one of the foulest tasting substances known to man. If early people devised their philosophy that something had to be nasty tasting to work, from the herbs that actually did work, then you can be sure that echinacea was one of those that they concluded that from, because it is truly horrid. BUT...

It is also one of the more respected herbs for infection prevention. It is believed to have anti-viral properties, and in some studies, this has been shown to have some validity. It is recommended for other purposes also, but this is the biggie, and the one that may have value for diabetics.

Reduction in immune response is one of the long term affects of diabetes. Echinacea has the potential to have value for some diabetics in warding off opportunistic infections, and in speeding recovery.

Reported side effects are rare, but do happen. If this herb is as powerful as it is believed to be, then it has equal potential for negative affects for some people, so use it cautiously until you know how your body will respond to it.
I stumbled across dill seed in one of my net searches for yet another food to help with my climbing glucose levels. I had some on hand, because I use it in a bread recipe. It fit my criteria for being either something my body was likely lacking, or a food that was common enough that the chances of side effects were low.

The evidence for its efficacy was sparse, but I ran across it in more than one source (more than just duplicated content), so I decided it was worth a try. Unfortunately, I cannot tell you whether it would work or not, because use of it caused me to feel nauseous. Several supplements do this to me, and if they do that, I don't take them. My body tends to react oddly to many supplements so this is no suggestion that it might do the same for anyone else.

Dill seed is used in foods, or ground as a powder. I put about a teaspoon of it into my morning shake. The seeds did not grind up very much, so the flavor did not strongly permeate the shake. Since the seeds stayed nearly whole, I had to drink them down and not expect the shake to be real smooth. It really was not unpleasant that way like I thought it would be, it did not taste bad, merely a bit odd. If it had not made me feel sick, I could have tolerated it on a daily basis and not minded.

Dill seed can be added to bread along with onion granules for a very flavorful and tasty bread. I am not sure if Dill Pickles will do the trick or not, but vinegar and salt do preserve well, so there is a good chance that they would (and vinegar is another potentially helpful item).
I was not able to find information on dosage amounts, so I just used a teaspoonful, but there is no telling whether that is enough, or even if smaller amounts would do.

Dandelion because usually it is an herb that is referenced for its high iron content.

A search though, proved that it was not a fluke. There were repeated references to its use in diabetes remedies, and warnings about monitoring blood sugar if it is used, especially in conjunction with glipizide and other similar medications.

I also found that whenever someone mentioned lowering of blood sugar, lowering of cholesterol was frequently mentioned alongside it. Research has shown that cholesterol levels are often related to blood sugar abnormalities, so this is logical.

Dandelion is also associated with increases in bile and stomach acid production. Those two functions often decrease in diabetics, making food digestion more problematic. One of the reasons lemon juice or vinegar is recommended is to help replace low stomach acid levels, so this affect would not be a negative one unless you have a tendency to heartburn, or gallbladder disease already.

Dandelion also is thought to be a diuretic, which may affect people with kidney or circulatory problems - in a positive or negative way, depending on your condition. Many herbalists suggest it
may be easier on the body than prescription diuretics because it also contains high levels of potassium, which most diuretics leech out of the body.

Because of its potential varied effects, please consult your doctor before you try it, and then monitor results very carefully.
NELSON

METHOD

OF

HEALTH CARE

1. Reduce causes of disease

2. Rebuild organs and tissue destroyed by causes

3. Unblock the blockages of flow

4. Treat symptoms NATURALLY

5. Metabolic and constitutional therapy.
For item number one reduce the cause of the disease, in this case diabetes. Use the following radiation detox formula to detox and sweep any radiation factors or alpha ray particles from the system.

RADIATION DETOX Formula 1 teaspoon of Prussian Blue paint powder, 1 tablespoons of bentonite clay, 1 teaspoon of powdered charcoal. Put into capsules and take 5 large capsules a day for three days. Mix in water if you are brave. And drink once a day one third for three days. Increase fiber in the diet and this will sweep excess toxins and any radiation compounds from the intestine. Once is enough or more if there is constant exposure. Lots of miso soup and sodium alginate, sea weed or the New Vstas product Algin. The homeopathic of 10 x of parotitis (mumps) for three days.

For item number two rebuild the organic tissue we need a healthy regime.

2.1. No bad sugars, no bad oils. (see the sugars oil book) this next two charts should get you the basics.

2.2. Exercise is a must for 20 minutes 4 times a week, work till a sweat. Walking, playing, and not working. This is vital.

2.3. Relax after meals. For 30 minutes after meals allow you pancreas to focus on digestion and this will help the pancreas work well. Reduce and remove all emotional stress during meals and for 30 minutes after. Soft music, rest, companionship and laughter as much as you can after eating. Celebrate the meal do not over eat but eat wisely.

2.4. Meditation on health 15 minutes a day.
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Natural Treatments for Type 2 Diabetes

By Cathy Wong, About.com Guide

Updated October 27, 2007

About.com Health’s Disease and Condition content is reviewed by our Medical Review Board

See More About:

- remedies for diabetes
- ginseng
- chromium
- magnesium
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Hypoglycaemia is a common problem for many patients with diabetes. www.touchendocrinology.com

**What is Type 2 Diabetes?**

According to the American Diabetes Association, nearly 21 million people in the United States have diabetes, with about 90 to 95% having type 2 diabetes.

Sugar, in the form of glucose, is the main source of fuel for body cells. The hormone insulin allows glucose in blood to enter cells. In type 2 diabetes, either the body doesn’t produce enough insulin or cells are resistant to effects of insulin.

As a result, glucose builds up in the blood instead of entering cells, which causes cells to be deprived of energy. If high glucose levels in the blood persist, it may damage the eyes, heart, kidneys, or nerves.

**Natural Remedies for Type 2 Diabetes**

There are some natural treatments that are being explored for type 2 diabetes. If you are interested in trying a natural treatment in addition to standard treatment, be sure do so only under the close supervision of a qualified health professional. If diabetes is not properly controlled, the consequences can be life-threatening.

Also inform your physician about any herbs, supplements, or natural treatments you are using, because some may interact with the medications you are taking and result in hypoglycemia unless properly coordinated. Consider keeping track of your herbs, vitamins, and supplements with the Supplement Diary and giving your doctor a copy.

1) Ginseng

Although there are several different types of ginseng, most of the promising studies on ginseng and diabetes have used North American ginseng (Panax quinquefolius). Those studies have shown that
North American ginseng may improve blood sugar control and glycosylated hemoglobin (a form of hemoglobin in the blood used to monitor blood glucose levels over time) levels.

- [Ginseng Fact Sheet](#)
- [Ginseng and Blood Sugar](#)

2) Chromium

Chromium is an essential trace mineral that plays an important role in carbohydrate and fat metabolism and helps body cells properly respond to insulin. In fact, studies have found low levels of chromium in people with diabetes.

There are many promising studies suggesting chromium supplementation may be effective, but they are far from conclusive. For example, a small study published in the journal *Diabetes Care* compared the diabetes medication sulfonylurea taken with 1,000 mcg of chromium to sulfonylurea taken with a placebo. After 6 months, people who did not take chromium had a significant increase in body weight, body fat, and abdominal fat, whereas people taking the chromium had significant improvements in insulin sensitivity.

Another study published in the same journal, however, examined the effect of chromium on glycemic control in insulin-dependent people with type 2 diabetes. People were given either 500 or 1,000 mcg a day of chromium or a placebo for six months. There was no significant difference in glycosylated hemoglobin, body mass index, blood pressure, or insulin requirements across the three groups.

One form of chromium not recommended is chromium picolinate. For more information, read [Chromium Picolinate Side Effects](#).

3) Magnesium

Magnesium is a mineral [found naturally in foods](#) such as green leafy vegetables, nuts, seeds, and whole grains and in nutritional supplements.

Magnesium is needed for more than 300 biochemical reactions. It helps regulate blood sugar levels and is needed for normal muscle and nerve function, heart rhythm, immune function, blood pressure, and for bone health.

Some studies suggest that low magnesium levels may worsen blood glucose control in type 2 diabetes. There is also some evidence that magnesium supplementation may help with insulin resistance.

For example, a study examined the effect of magnesium or placebo in 63 people with type 2 diabetes and low magnesium levels who were taking the medication glibenclamide. After 16 weeks, people who took magnesium had improved insulin sensitivity and lower fasting glucose levels.
High doses of magnesium may cause diarrhea, nausea, loss of appetite, muscle weakness, difficulty breathing, low blood pressure, irregular heart rate, and confusion. It can interact with certain medications, such as those for osteoporosis, high blood pressure (calcium channel blockers), as well as some antibiotics, muscle relaxants, and diuretics.

4) Cinnamon

A couple of studies have found that cinnamon improves blood glucose control in people with type 2 diabetes. In the first study, 60 people with type 2 diabetes were divided into six groups. Three groups took 1, 3 or 6 g of cinnamon a day and the remaining three groups consumed 1, 3 or 6 g of placebo capsules. After 40 days, all three doses of cinnamon significantly reduced fasting blood glucose, triglycerides, LDL cholesterol, and total cholesterol.

In another study, 79 people with type 2 diabetes (not on insulin therapy but treated with other diabetes medication or diet) took either a cinnamon extract (equivalent to 3 g of cinnamon powder) or a placebo capsule three times a day.

After four months, there was a slight but statistically significant reduction in fasting blood glucose levels in people who took the cinnamon (10.3%) compared with the placebo group (3.4%), however, there was no significant difference in glycosylated hemoglobin or lipid profiles. For more about cinnamon, read Cinnamon and Blood Sugar and Is Cinnamon a Proven Diabetes Remedy?

5) Zinc

The mineral zinc plays an important role in the production and storage of insulin. There is some research showing that people with type 2 diabetes have suboptimal zinc status due to decreased absorption and increased excretion of zinc. Food sources of zinc include fresh oysters, ginger root, lamb, pecans, split peas, egg yolk, rye, beef liver, lima beans, almonds, walnuts, sardines, chicken, and buckwheat.

6) Aloe Vera Gel

Although aloe vera gel is better known as a home remedy for minor burns and other skin conditions, recent animal studies suggest that aloe vera gel may help people with diabetes.

A Japanese study evaluated the effect of aloe vera gel on blood sugar. Researchers isolated a number of active phytosterol compounds from the gel that were found to reduce blood glucose and glycosylated hemoglobin levels. For more information about aloe vera, read the Aloe Vera Fact Sheet.
Supplement Fatty Acids. Use Vitamin E, A, K, D, Flax seed oil, lecithin, omega 3-6 use cold non processed Oils

Trans-fatty acids

Trans-fatty acids are found in fried foods, commercial baked goods, processed foods and margarine

Bad Fatty Acids must be avoided

Foods Boiled in Oil are Slow Poisens
Low- Calorie Diet Can Save from Type 2 Diabetes, Says Study

Type 2 diabetes can be overturned with the intake of low-fat diet, confirm the researchers. Professor Roy Taylor of Newcastle University stated that an eight week of low calorie diet plan can save a person from taking high medication for diabetes.
Prof. Taylor who headed the study said that type 2 diabetes has always been considered as a lifelong syndrome. It is an unending condition which includes a lot of intake of pills and finally people go for insulin, he said. But according to this study, with the intake of low calorie diet, the body can create its own insulin and therefore can release a person from the disease.

The study was conducted on eleven patients with type 2 diabetics. The fat rate was checked in their pancreas as it helps in controlling blood sugar levels. After the examination these patients underwent a diet plan of 600 calories a day which included tea, zero calorie drinks, low fat shakes.

The blood sugar levels were better in just a period of one week and later in two months the fat in the pancreas of these people was back to normal and pancreas were creating insulin as normal.

These people then went on a normal diet avoiding the high calorie food and lived a normal life. "The insulin-producing cells in the pancreas have gone to sleep in type 2 diabetes - they are not really doing very much", said Prof. Taylor.
600 CALORIES A DAY

**DAY 1**

**Breakfast:**
Black coffee or tea, ½ grapefruit, 1 slice of toast with peanut butter.

**Lunch:**
2 slices of meat, 1 cup green beans, 1 cup beets, coffee or tea.

**Dinner:**
½ cup tuna, 1 slice of toast, 1 small apple, ½ cup vanilla ice-cream.

**DAY 2**

**Breakfast:**
Coffee or black tea, ½ banana, 1 slice of toast, 1 hard-boiled egg.

**Lunch:**
1 cup cottage cheese, 8 saltine crackers, ½ cup carrots, ½ banana, coffee or black tea.

**Dinner:**
1 hot dog, 1 cup broccoli or cabbage, ½ cup of vanilla ice-cream.

**DAY 3**

**Breakfast:**
Coffee or black tea, 5 saltine crackers, 1 slice cheddar cheese.

**Lunch:**
1 hard-boiled egg, 1 slice of toast, coffee or black tea.

**Dinner:**
1 cup tuna, 1 cup cauliflower, ½ cantaloupe, ½ cup of vanilla ice-cream.

The diet cannot last more than 3 consecutive days; it can always be resumed a 4-day break between diet periods. Only artificial sweeteners are permitted. Snacks are not.

Drink 4 glasses of water per day.
Spices permitted: herbs, lemon, vinegar, Worcestershire sauce, soy sauce, mustard, salt and pepper.
The Medieval Black Plague was caused by Dextrose Sugar + Lack of Sewage

Louis Pasteur was not a doctor he was a wine scientist. But he made an incredible advance in medicine by relating microorganisms to disease. The germ theory was born. Up till then a doctor always washed his hands with surgery that is he always washed his hands after surgery. There was a major intolerance of Pasteur’s work by arrogant medical doctors who did not like a wine specialist interfering with their practice. There is always resistance to new ideas. So for a time they past a law that prohibited washing hands before surgery. But soon the intellect persisted and the germ theory became accepted.
But on his death bed Louis Pasteur had a tremendous insight. He said "it is not the Fauna but the Flora, the terrain is everything." He realized too late that the conditions of the body determine how a microorganism grows.

There are many reasons for microorganism to flourish and become opportunistic causes of disease. The following diagram shows the immune system the Reticulo-Endothelial System.
Notice the Neuro-Immuno system link of Mind to Body. Stress can disturb the immune system. And Dextrose sugar has been proven to have a negative effect on the immune system. Dextrose sugar goes too quickly into the cells for energy and the white blood cells run to the spleen to hide and are destroyed. Dextrose sugar lowers the white blood cell count. Overdosing on Fructose can be bad for the small intestine but five portions of fruits and vegetables are still the way to go.

The Big Sugar cartel has spent a lot of time and money to create lies and rumours about dextrose use versus fructose. The high fructose corn syrup is not a natural compound and it has many reasons to avoid it. The bottom line is trust nature.
Stress

HyperGlycemia

Fatty Acids taken from cell Membranes

Stimulates glucose uptake by cells

Tissue cells

Blood glucose falls to normal range

HypoGlycemia

Homeostasis: Normal blood glucose level (about 90 mg/100 ml)

Stimulus: Rising blood glucose level

Stimulates glycogen formation

Pancreas

Stimulates glycogen breakdown

Liver

Glucose

Glycogen

Glucagon

Stimulus: Declining blood glucose level

Blood glucose rises to normal range

High Glycemic Index = DISEASE
"Well all we have to do is follow the candy and sugar holidays to sell our Flu shots and Drugs to the People. They will never believe that sugar weakens their immune systems. They believe what we tell them to believe."
Dextrose enters the Cells directly and thus makes the pancreas put out twice as much insulin as Levulose. Levulose (aka Fructose) must go to the liver for conversion and thus is more Healthy in delivery.

Fructose Transport

Fructose is absorbed in the small intestine, then enters the hepatic portal vein and is directed toward the liver. The metabolism of fructose at this point yields intermediates in the gluconeogenic and fructolytic pathways leading to glycogen synthesis as well as fatty acid and triglyceride synthesis.
Dextrose sugar feeds cancer cells 45 times more than fructose.
conversion in the liver

Dextrose enters the Cells directly and thus makes the pancreas put out twice as much insulin as Levulose. Levulose (aka Fructose) must go to the liver for conversion and thus is more Healthy in delivery.
Blood sugar up and down cascades are responsible for many different disease.

If we trace the history of sugar we see the history of plague following it. Dextrose sugar weakens the immune system and then normal micro-organisms become pathogenic. This is the case with the plague bacteria which existed well prior to the onset of the plague. The immune deficiency caused by stress and sugar coupled with poor sanitation and poor lifestyle allowed for a pathogen to become opportunistic grow to large numbers and overtake people’s immune systems.

**Immuno Weakness in the Middle Ages**

The earliest experiences the English had of refined sugar was when Crusaders brought sugar home with them after their campaigns in the Holy Land, where they encountered caravans carrying "sweet salt". Crusade chronicler William of Tyre described sugar as "very necessary for the use and health of mankind." This Dextrose sugar weakened the immune systems but the sugar was in limited supply. There were plagues that followed the crusaders home but it was there supply of sugar that made it possible.
Sugar is one of the oldest and best documented of all of the medieval commodities. Exactly what form, quality and price this commodity achieved could be variable enough to create material for disagreement whenever the product is discussed. What we do know is that it was much more widespread than is commonly believed. A Saxon of the middle and/or lower classes, in pre 800's England, would certainly have had only honey for a sweetner. However, an Elizabethian ate so much refined, white sugar, that the English were noted for their bad teeth and the sweetmeats that they consumed. For all the many countries and times between conditions of the sugar varied considerably. With the following information I hope to establish the cost, quality, and availability of sugar. Not only in the British Isles, but on the continent as well.

Sugar In India and Persia

In 510 BC hungry soldiers of the Emperor Darius were near the river Indus, when they discovered some "reeds which produce honey without bees". They called it sakchar by 300 BC the use has spread and Darius's army is weakened by over use of the dextrose sugar and Alexander defeats them outnumbered over ten to one. In 327 BC Alexander the Great army then starts to use the sugar and gradually they lose strength and dissipate from weakness. Alexander spread dextrose sugar cane through Persia and introduced it in the Mediterranean. This was the beginning of one of the best documented products of the Middle Ages. But wherever it goes it first weakens the immune system.

In 95 AD, in a document entitled "Periplus Maris Erythraei", (or "Guide Book to the Red Sea"), an unknown merchant says there is "Exported commonly....Honey of reeds which is called sakchar." This is possibly the first mention in European history of the use of sugar cane as an article of commerce.

From: "The Wonder That Was India" by A. L. Basham we learn that "In ancient India...."(Since Nero's Time) "...sugar cane was grown, and exported to Europe..." and "...in the time of the Caesars...The main requirements of the West were spices, perfumes, jewels and fine textiles, but lesser luxuries, such as sugar, rice and ghee were also exported." According to Will Durant, who told us the Darius and Alexander the Great stories above in his "Age of Faith", pressing and boiling cane to create sugar as such was first done in India about 300 AD. Prior to this, the juice was used much like honey, as a sweetener for food and drinks. About 540 AD, the Persians had
learned sugar making from India. We now know that there was a lot more contact from India through the Mediterranean world than was previously thought. An example of this is the manner in which Indian literature found its way to the Western countries.

In "The History and Culture of the Indian People, The Classical Age" Vol. 3, the authors note:

"That Indian literature was highly valued in these countries..." (meaning europe and the med) 
"....is known by the history of a single book Panchatantra....translated in the 6th century into pehlevi then Arabic then from Arabic to Hebrew, Latin, Spanish, Italian and various other languages of Europe..." (Obviously there was communication and trade...for mention of sugar being traded, see previous.) They also state in another place that "In the seventh century...sugar canes were abundant in this country...", meaning India. By 600 AD, again according to Durant, knowledge of how to produce crystallized sugar was wide spread in this area. (India and Persia) We do know that in 627 AD, the Greek Emperor Heraclius seized a treasury of sugar in the Royal Palace at Ctesiphon. In 641 AD, the Arabs without sugar conquered Persia, and then having learned to cultivate sugar cane, spread it's culture to Egypt, Sicily, Morrocco, and Spain, from which sources it reached Europe. Disease follows in the wake.

The Arab Connection

In 827 Moslems landed for the first time in Sicily. It took until 965 to secure their foothold. 
"Moslem rule was an improvement over that of Byzantium. The latifondi were divided among freed serfs and smallholders, and agriculture received the greatest impetus it had ever known. Thanks to a Moslem custom, uncultivated land became the property of whoever first broke it, thus encouraging cultivation at the expense of grazing. Practically all the distinguishing features of Sicilian husbandry were introduced by the Arabs: citrus, cotton, carob, mulberry, both the celso, or black and the white morrella-sugar cane, hemp, date palm, the list is almost endless." This according to "The Barrier and the Bridge-Historic Sicily" by Alfonso Lowe, Published in 1972. Sugar will weaken the armies and make them more susceptible to disease.

By the end of the ninth century, says "A History of Sicily" by D. Mack Smith, "In Sicily...they planted lemons and bitter oranges. They brought the knowledge of how to cultivate sugar cane and crush it with mills...they introduced the first cotton seeds, the first mulberries and silkworms, the date palm, the sumac tree for tanning and dying, papyrus, pistachio nuts and melons." The Dark ages can be associated with sugar use.

"They introduced...the cotton plant and the sugar cane" and "They were great traders; under their rule Palermo became an international market where merchants from the Christian Italian cities were as welcome as Muslim merchants from Africa and the East. " we are told in "The Sicilian Vespers" by Steven Runciman.

John Julius Norwich, in "The Other Conquest", says the Saracens in Sicily "...introduced cotton and papyrus, citrus and date-palm and enough sugar-cane to make possible, within a very few
years, a substantial export trade."

In "A History of Sicily", Finley, Smith and Duggan add that "They...brought the knowledge of how to cultivate sugar cane and crush it with mills." This tells us that finely powdered sugar was produced in Sicily in the 800's.

In 950 AD, Al Istakhri wrote of extensive irrigation in an area northwest of the Persian Gulf, for sugar cane. He said it was, "Partly used as a food, and partly made into sugar." Also, that in Asker-Mokarram, "All of the people make their living from sugar cane." He mentions cane cultivation as far away as the Caspian Sea, the Hindu Kush, and what is now modern Afghanistan.

Durant, in the "Age of Faith", quotes the Chronicler of "Gesta Francorum", written about 1097 AD, that "many Crusaders died...having found novel nourishment by chewing the sweet reeds called Zucar." By 1099 AD, the knowledge of how to refine sugar had been transmitted from the Holy Lands into Europe. But the negative effects on health are unrecognized.

**Arab-Norman Trade Death**

"The so-called Dark Ages were lighter than we used to believe, and there was a constant interchange of knowledge and ideas between the supposedly hostile worlds of the Cross and the Crescent....The Chevron, or zig-zag, provides an excellent example, for it decorates many a Sicilian door and window. It is invariably adduced as evidence of Arabic workmanship, though we know exactly when and where it originated:

' A second decorative motif, which appears soon afterwards ' (after 1110) , says Stoll, ' rapidly became a distinguishing characteristic of Late English Romanesque. This was the chevron, or zig-zag, a motif whose fecundity was such that it spread virtually everywhere...and even traveled to Apulia and Sicily in the wake of the Normans. ' "

The "Stoll" here quoted was the author of "Architecture and Sculpture in Early Britain", being quoted by the author of "The Barrier and the Bridge-Historic Sicily", Alphonso Lowe.

After Roger de Hauteville was crowned King of Sicily in 1130, he recognized quickly that he
would need Arab support to survive. According to Norwich, in "The Kingdom In The Sun 1130-1194", "There would be no second class Sicilians. Everyone, Norman or Italian, Lombard or Greek or Saracen, would have his part to play in the new state....A Greek was appointed Emir of Palermo...another...the navy...Control of the Exchequer was put into the hands of the Saracens. Special Saracen brigades were established in the army, quickly earning a reputation for loyalty and discipline which was to last over a hundred years."

In the 1160's William II of Sicily's "greatest act of patronage was to build the immense Benedictine Abbey of Monreale....The Abbot became the largest landowner after the King himself....His estates included mills and a factory for processing sugar cane....." says D. Mack Smith's "A History of Sicily".

"Crusade or no Crusade, the Normans were too shrewd to allow racial or religious considerations to interfere with their conquest. A hundred years later, (Palermo fell in 1072, so this would be 1172) Christians and Saracens were living side-by-side, amicably enough...Tolerance and adaptability were the two Norman qualities that made the kingdom of Sicily one of the most brilliant of it's time."

So although much is often made of the intolerant and bigoted prevention of trade and social intercourse between Arab and Christian, Lowe's "The Barrier and the Bridge-Historic Sicily" here seems to hold quite a differing view.

In the "Epistola ad Petrum" in 1194, the author describes the area around Palermo lovingly, including, "vines, vegetables, fruit trees, sugar-canines and date-palms". See "The Norman Kingdom of Sicily" for the English description. The Arabs and following them, the Normans seem to have had no trouble enjoying the sweet profits of Sugar and its export in all forms in the 12th century.

**Sweet Victory in the Crusades But they bring Back Death**

We know from Geoffrey de Vinsauf's "Itinerary of Richard I and Others, to the Holy Land", that in 1192 AD, King Richard I takes a caravan in his campaign in the Crusades...and that

"By this defeat the pride of the Turks was entirely cast down, and their boldness effectually repressed; whilst the caravan, with all its riches, became the spoil of the victors. Its guards surrendered to our soldiers themselves, their beasts of burden, and sumpter horses; and stretching forth their hands in supplication, they implored for mercy, on condition only that their lives should be spared. They led the yoked horses and camels by the halter, and offered them to our men, and they brought mules loaded with spices of different kinds, and of great value; gold and silver; cloaks of silk; purple and scarlet robes, and variously-ornamented apparel, besides arms and weapons of divers forms; coats of mail, commonly called gasiganz; costly cushions, pavilions, tents, biscuit, bread. barley, grain, meal, and a large quantity of conserves and medicines; basins, bladders, chess-boards; silver dishes and candlesticks; pepper, cinnamon, sugar, and wax; and other valuables of choice and various kinds; an immense sum of
money, and an incalculable quantity of goods, such as had never before (as we have said) been taken at one and the same time, in any former battle."

War or no war, though, trade is still necessary. Even Pope Innocent III in his "License to Venice to Trade with The Saracens" written in 1198, recognizes that trade is paramount.

"Besides the indulgence we have promised to those going at their own expense to the east, and besides the favor of apostolic protection granted to those helping that country, we have renewed the decree of the Lateran council which excommunicated those who presume to give arms, iron, or wood to the Saracens for their galleys, and which excommunicated those who act as helmsmen on their galleys and dhows, and which at the same time decreed that they should be deprived of their property for their transgressions by the secular arm and by the consuls of the cities, and that, if caught, they become the slaves of their captors. Following the example of Pope Gregory, our predecessor of pious memory, we have placed under sentence of excommunication all those who in future consort with the Saracens, directly or indirectly, or who attempt to give or send aid to them by sea, as long as the war between them and us shall last.

But our beloved sons Andreas Donatus and Benedict Grilion, your messengers, recently came to the apostolic see and were at pains to explain to us that by this decree your city was suffering no small loss, for she is not devoted to agriculture but rather to shipping and to commerce. We, therefore, induced by the paternal affection we have for you, and commanding you under pain of anathema not to aid the Saracens by selling or giving to them or exchanging with them iron, flax, pitch, pointed stakes, ropes, arms, helmets, ships, and boards, or unfinished wood, do permit for the present, until we issue further orders, the taking of goods, other than those mentioned, to Egypt and Babylon, whenever necessary. We hope that in consideration of this kindness you will bear in mind the aiding of Jerusalem, taking care not to abuse the apostolic decree, for there is no doubt that whosoever violates his conscience in evading this order will incur the anger of God."

(Trade with the Saracens was too important to interrupt it for war)


"15. For the duties on sugar for that which is imported and exported by land and by sea, the rule commands that one should take per hundred, 5 B. as duty.

16. For the duties per camel's load of sugar the rule commands that one should take 4 B. as duty.

17. For the duty on sugar which is brought by beasts of burden the rule commands that one should take 1 raboin per load as duty.
It is understood that the rule commands that one should take on Nabeth sugar, an internal tax."

According to the "Illustrated History of the Crusades", edited by Jonathan Riley-Smith, a castle at Paphos on Cyprus in 1191 AD. (called Saranda Kolones), probably built by the Hospitallers, had a sugar mill constructed in the castle's basement. This indicates that the sugar was produced as cane in the manor system, processed into sugar at the castle, then shipped into Europe to be sold for cash to swell the Hospitallers coffers.

Meanwhile, Back in Sicily...

Frederick II, Holy Roman Emperor, in the 1220's "encouraged silk and sugar production" says "A History of Sicily" by M.I. Finley, D. Mack Smith, and Christopher Duggan, and "The rural interests of citizens received further protection from royal officials in 1243 over an ancient right to cut canes in the sugar plantations for use in their vineyards and pasture for their tamed bulls" adds Donald Matthew in "The Norman Kingdom of Sicily". In 1231 AD, Frederick II, at Melfi, issued "Liber Augustalis", in which, among other things he included laws to foster cultivation of sugar cane. This was because some part of his revenue came from taxes levied on processed sugar.

Elsewhere in Europe

In England in 1226 AD, Henry III had trouble finding 3 pounds of sugar for a banquet, but by 1259 AD, the commodity was more readily available, at a price of 16 1/2 pence per pound. (See Charts in Table 1 and 2) One is forced to conclude that the shortage of sugar in Henry's time had more to do with the Holiday causing a shortage than the rarity of the product.

As noted in The Book of Spices by Frederic Rosengarten, Jr., in 1264 cassia sold in London for 10 shillings a pound, while sugar at the same time sold for 12 shillings, ginger for 18 shillings, and cumin for 2 shillings." So sugar was about the same price as other spices, at this time, but somehow the perception is that is was a very rare and overly expensive item to have on hand,
although the same perception does not exist for cinnamon, cassia, ginger, or cumin!

According to A List of the Tolls at the Port of Colibre, in 1252, Colibre, a small island off the northeast coast of Spain, and under the jurisdiction of Rousillon in the thirteenth century, gave a list of what tolls were to be charged for what products. Sugar is prominently mentioned. Herein is a small portion of that list:

".......A cargo of mastic---2 solidi

A cargo of gum---2 solidi

A cargo of sugar---2 solidi

A cargo of red dye---2 solidi

A cargo of blue dye---2 solidi

A bundle of leather---2 solidi ......"

Francesco di Balducci Pegolotti, in "The Practice of Commerce", written in Florence between 1310 AD and 1340 AD, wrote of the goods available in the market place. These included powdered sugars of Cyprus, Alexandria, Cairo, Kerak, and Syria. Also lump sugar, basket sugar, rock candy, rose sugar, and violet sugar , from Cairo and Damascus. This is the first marketing of powdered sugar (finely granulated) I have found, though the Sicilian manufacture of it above would strongly suggest it previous to this. Much must have been ground locally at the site of use. The list has "Dots" next to those items which are high cost/low volume or, as they were called "minute spices". It is significant that sugars were not so designated.

The first outbreak of plague swept across England in 1348-49. It seems to have travelled across the south in bubonic form during the summer months of 1348, before mutating into the even more frightening pneumonic form with the onset of winter. It hit London in September 1348, and spread into East Anglia all along the coast early during the new year. By spring 1349, it was ravaging Wales and the Midlands, and by late summer, it had made the leap across the Irish Sea and had penetrated the north. The Scots were quick to take advantage of their English neighbours' discomfort, raiding Durham in 1349. Whether they caught the plague by this action, or whether it found its way north via other means, it was taking its revenge on Scotland by 1350.

It would be fair to say that the onset of the plague created panic the length and breadth of Britain. One graphic testimony can be found at St Mary's, Ashwell, Hertfordshire, where an anonymous hand has carved a harrowing inscription for the year 1349:
'Wretched, terrible, destructive year, the remnants of the people alone remain.'

The plague's journey across the length and breadth of Britain:

'Sometimes it came by road, passing from village to village, sometimes by river, as in the East Midlands, or by ship, from the Low Countries or from other infected areas. On the vills of the bishop of Worcester's estates in the West Midlands, they (the death rates) ranged between 19 per cent of manorial tenants at Hartlebury and Hanbury to no less than 80 per cent at Aston.... It is very difficult for us to imagine the impact of plague on these small rural communities, where a village might have no more than 400 or 500 inhabitants. Few settlements were totally depopulated, but in most others whole families must have been wiped out, and few can have been spared some loss, since the plague killed indiscriminately, striking at rich and poor alike.'


"Les Livres de comptes des freres Bonis" includes an account from 1339-1369 AD, in which it states that Bernat Brunet, a provencal merchant of Montauban "owes for one once of Loaf sugar which Frances, his Nephew, took on October 10, for the said Bernat was ill:" the amount of 1 shilling. This price seems very high, since even as far away as England, 11 pence could buy you a full pound, by then. (Maybe this is the origin of the Sugar Pill!), prices cannot be evaluated from a single mention, but rather should be noted over time, with prices adjusted for coinage value changes.

**Important Facts about the Black Death**

*Interesting information and important facts and history of the disease:*

- **Key Dates relating to the event:** Dextrose sugar becomes cheap and plentiful in about 1310. This terrible plague started in Europe in 1328 and lasted until 1351 although there were outbreaks for the next sixty years.
- **Why was the disease called the Black Death?** The disease was called the Black Death because one of the symptoms produced a blackening of the skin around the swellings, or buboes. The buboes were red at first, but later turned a dark purple, or black. When a victim's blood was let the blood that exuded was black, thick and vile smelling with a greenish scum mixed in it.
- **How the disease was spread:** The Black Death was spread by fleas that were carried by rats or other small rodents and people eating dextrose sugar from sugar cane for the first time have massive immune deficiency.
- **The spread of the Black Death followed all of the Sugar Trade Routes to every country**
- **The Black Death of the Middle Ages was believed to have originated in the same spot where cane (dextrose) Sugar came from**
- **Key People relating to the event:** Nearly one third of the population of died - about 200 million people in Europe.
- **The 1328 outbreak in China after sugar spread there, caused the population to drop from 125 million to 90 million in just fifty years**
- **7500 victims of the disease were dying every day**
- The Black Death in England raged from 1348-1350
- Why the Black Death was important to the history of England: The population drop resulted in a higher value being placed on labour - the Peasants Revolt followed in 1381. Farming changed and the wool industry boomed. People became disillusioned with the church and its power and influence went into decline. This ultimately resulted in the English reformation.

**Black Death Symptoms**
The symptoms of the Black Death were terrible and swift:

- Painful swellings (buboes) of the lymph nodes
- These swellings, or buboes, would appear in the armpits, legs, neck, or groin
- A bubo was at first a red color. The bubo then turned a dark purple color, or black
- Other symptoms of the Black Death included:
  - a very high fever
  - delirium
  - the victim begins to vomit
  - muscular pains
  - bleeding in the lungs
  - mental disorientation
- The plague also produced in the victim an intense desire to sleep, which, if yielded to, quickly proved fatal
- A victim would die quickly - victims only lived between 2 -4 days after contracting the deadly disease

**Black Death Victims in the Middle Ages - Treatments**
The Black Death victims in the Middle Ages were terrified of the deadly disease. The plague held a massive mortality rate between 30 and 40%. Victims had no idea what had caused the disease. Neither did the physicians in the Middle Ages. The most that could be done was that various concoctions of herbs might be administered to relieve the symptoms - there was no known cure. Headaches were relieved by rose, lavender, sage and bay. Sickness or nausea was treated with wormwood, mint, and balm. Lung problems were treated with liquorice and comfrey. Vinegar was used as a cleansing agent as it was believed that it would kill disease. But bloodletting was commonly thought to be one of the best ways to treat the plague. The blood that exuded was black, thick and vile smelling with a greenish scum mixed in it.

- Black Death Treatment: Black Death was treated by lancing the buboes and applying a warm poultice of butter, onion and garlic. Various other remedies were tried including arsenic, lily root and even dried toad.
- During a later outbreak of this terrible plague, during the Elizabethan era, substances such as tobacco brought from the New World were also used in experiments to treat the disease.

**Black Death in England - 1348-1350**
The Black Death reached England in 1348. Bristol was an important European port and city in England during the Medieval era. It is widely believed that Bristol was the place where the
Black Death first reached England. The plague reached England during the summer months between June and August. The Black Death reached London by 1st November 1348. London was a crowded, bustling city with a population of around 70,000. The sanitation in London was poor and living conditions were filthy. The River Thames brought more ships and infection to London which spread to the rest of England. The crowded, dirty living conditions of the English cities led to the rapid spread of the disease. Church records that the actual deaths in London were approximately 20,000. Between 1348 and 1350, killed about 30 - 40% of the population of England which at the time was estimated to be about five to six million. Many people were thrown into open communal pits. The oldest, youngest and poorest died first. Whole villages and towns in England simply ceased to exist after the Black Death.

**Black Death during the Elizabethan Era**

**The Black Death Victims in the Middle Ages - The daughter of the King of England**
The Black Death struck people and took its victims from all walks of society. **King Edward III** (1312 – 1377) was King of England during the terrible period of the plague. Edward had arranged a marriage for his favorite daughter Joan Plantagenet. Joan was born in February 1335 in Woodstock. Joan was to marry King Pedro of Castille, the son of Alfonso XI and Maria of Portugal. The marriage was to take place in Castille. Joan (sometimes referred to as Joanna) left England with the blessing of her parents. The Black Death had not yet taken its hold in England and its first victims had only been claimed in France in August 1348. Joan travelled through France and contracted the deadly disease. She died on 2 Sep 1348 in Bayonne of the Black Death.

**The Black Death and Religion**
During the Middle Ages it was essential that people were given the last rites and had the chance to confess their sins before they died. The spread of the deadly plague in England was swift and the death rate was almost 50% in isolated populations such as monasteries. There were not enough clergy to offer the last rites or give support and help to the victims. The situation was so bad that Pope Clement VI was forced to grant remission of sins to all who died of the Black Death. Victims were allowed to confess their sins to one another, or "even to a woman". The church could offer no reason for the deadly disease and beliefs were sorely tested. This had such a devastating effect that people started to question religion and such doubts ultimately led to the English reformation.

**Consequences and Effects of the Black Death plague**
The Consequences and effects of the Black Death plague were far reaching in England:

- Prices and Wages rose
- Greater value was placed on labor
- Farming land was given over to pasturing, which was much less labor-intensive
- This change in farming led to a boost in the cloth and woolen industry
- Peasants moved from the country to the towns
- The Black Death was therefore also responsible for the decline of the Feudal system
- People became disillusioned with the church and its power and influence went into decline
Nostradamus was a healer of sort and he said for people to clean their houses, open the windows and let in good sunshine and clean air. He recommended good foods and exercise. These common sense suggestions helped to end the plague. Also people started to develop tolerance for the dextrose sugar.

In the recipe listings of "Le Menagier de Paris", 1393, sugar in many various forms is listed 72 separate times. Honey by comparison is only mentioned 24 times, and the price for candied orange peel, made with honey, is precisely the same as that for sugared almonds (10 sous/lb).
So, in a quick survey of Europe in the 13th and 14th centuries, sugar was widely available in England, France, Spain, and Italy in powdered form as well as block, in cooking as well as medicinally, and more widely used than honey!

**Spain Takes Sicily**

Things were going well in Sicily. "About 1410 there had been thirty sugar refineries in Palermo alone, and at Syracuse there was a 'gate of the sugar workers'. Special traffic regulations had been needed for the transport of firewood and cane. So valuable was sugar for the economy that the law allowed compulsory purchase of land for it, and water could be taken from whatever source; workers were also bound to the industry by law and were free from arrest during the season when the refineries were working." says Smith's "A History of Sicily."

Spain, in 1416, had taken over Sicily and was determined to make it pay. How? With sugar production and exports to Northern Europe, of course! During the 42 years following the accession of Alfonso in 1416, "On one occasion Alfonso personally seems to have cornered the market in sugar exports to Flanders," Smith tells us. So even with a change in leadership in Sicily, sugar exports only grew. Now the Northern coast cities seem to be regular customers. English recipes demonstrate how much sugar was flowing North.

England, 15th century. Pears in wine and spices Original recipe from Harleian MS 279. "Potage Dyvers" Perys en Composte. Take Wyne an Canel, a gret dele of Whyte Sugre, an set it on the fyre, hete it hote, but let it nowt boyle, an draw it thorwe a straynoure; than take fayre Datys, an pyke owt the stonys, an leche hem alle thinne, an caste ther-to; thanne take Wardonys, an pare hem and sethe hem, an leche hem alle thinne, caste ther-to in-to the Syryppe; thanne take a lytil Sawnderys, and caste ther-to, an sette it on the fyre; an yif thow hast charde quynce, caste ther-to in the boyling, an loke that it stonde wyl with Sugre, an wyl lyid wyth Canel, an caste Salt ther-to, an let it boyle; an than caste yt on a treen vessel, lat it kele, and serue forth

If "a gret dele of Whyte Sugre" was used, it can hardly have been THAT rare or expensive. The fourteenth century manuscript quoted below specifies two pounds sugar! of Original recipe from "Goud Kokery":

5. Potus ypocras. Take a half lb. of canel tried; of gyngyuer tried, a half lb.; of greynes, iii ounce; of longe peper, iii ounce; of clowis, ii ounce; of notemugges, ii ounce &mp; a half; of carewey, ii ounce; of spikenard, a half ounce; of galyngale, ii ounce; of sugir, ii lb. Si deficiat sugir, take a potel of honey.

Although the 'Si deficiat sugir, take a potel of honey' is often adduced to indicate sugar shortage, I would point out that possible substitutions for elements of a recipe were
common, and were not necessarily related to the scarcity of the items mentioned. (for instance, if you don't happen to have flour to thicken a chicken sauce, says one recipe, you can use eggs to thicken it instead. This didn't mean that flour was less common than eggs!)

**Other Sugar Producing Sites**

In the 1400's AD, plantations were established in Madeira, the Canary Islands, and St. Thomas. This greatly boosted supply. The Hospitaller castle of Kolossi, in Latin Cyprus was built by Jocques de Milly in 1454 AD, at the center of a sugar producing estate, and next to a sugar factory. At Kouklia a pair of refineries had water wheels to crush the cane. Kilns for boiling the liquid and ceramic molds to crystallize the sugar into loaves/cones. Another factory survives at Episkopi ("Illustrated History of the Crusades"). Sugar production was wide-spread on Cyprus and Sicily, and these weren't even considered the best sources of sugar.

In the "Book of the Wares and Usages of Diverse Contries", an Italian writing in Ragusa in 1458 AD, wrote, "How to know many Wares" where he says that "Rock Candy ought to be white, glistening, coarse, dry, and clean. Loaf sugar ought to be white, dry, and a well compact paste, and it's powder ought to be large and granulated." The quality of these marketed, powdered / granulated sugars seems to have been described as what we can buy currently in our modern markets. "White, dry" and "clean". The perception that all medieval sugar consisted of burnt black cones is a common misapprehension brought on by the experience of those of us who have been part of the Early American historical groups. Do-it-yourself pioneers in America produced some really bad sugars in an effort to be self-sufficient, but that should not be projected to our thoughts about Medieval times where industrial production and transport was common. Though some bought the cheaper loaf and saved money by grinding it themselves, powdered sugar was common, and the quality was high.

In 1470 AD, there was a "Society for the Refining of Sugars" in Bologna, which even the wealthy thought worth attending. It was NOT just the industry traders in luxuries, but a large portion of the wealthy had sugar growing on their estates.

In 1493 AD, Columbus carried sugar cane from the Canaries to Santa Domingo, and by the mid-1500's it's manufacture had spread over the greater part of Tropical America. In 1492 Christopher Columbus stopped at the Canary Islands on his famous journey, for rest and provisions for a few days, but ended up staying a month. When he finally left he was given cuttings of sugar cane which became the first to reach the New World. But with sugar cane he brought death and slavery.

Therefore much later Sugar Cane came to be cultivated in the New World, and as a side effect became multi-sourced particularly due to British Colonial policies (you see how this all links up now) and influence throughout the geographical coverage of the empire in the mid 1600s to mid
1700s. This is really the key point along the timeline where sugar, outside Asia, became commonly available and no longer a rare indulgence of the wealthy.

Notably, this was also closely linked to the international slave trade - African slaves became the dominant plantation workers in North America, partly because they turned out to be naturally resistant to Yellow Fever and Malaria, and as a result the British imported over 4 million slaves to the West Indies. At this point (the mid to late 1700s) the Caribbean was the world’s largest producer of sugar, and due to high death rates anyway on sugar plantations, there were only 400,000 African people left alive in the West Indies by the time slavery ended.
In 1772 Slavery was declared illegal in England, including overseas slaves not living in England. Lord Chief Justice Mansfield ruled that English law did not support slavery. But today the sugar slavery continues. Poor Blacks are grossly mistreated and paid almost nothing to harvest a deadly product. and this appalling process is rampant.

Later Barbados and the British Leewards were extremely successful in the production of sugar because it counted for 93% and 97% respectively of each island’s exports, largely due to changes in the eating habits of many Europeans.

In "The World of the Guilds in Venice and Europe, c. 1250 - c. 1650", we are told of "...the city's (Antwerp in the 1560's) great luxury industries: tapestries, furniture, sugar, and spices..."

William Harrison, in his 1577 description Of Elizabethan England, (from "Holinshead's
Chronicles") complains of the current high prices....

...in times past, when the strange bottoms were suffered to come in, we had sugar for fourpence the pound, that now at the writing of this Treatise is well worth half-a-crown; raisins or currants for a penny that now are holding at sixpence, and sometimes at eightpence and tenpence the pound; nutmegs at two pence halfpenny the ounce, ginger at a penny an ounce, prunes at halfpenny farthing, great raisins three pounds for a penny, cinnamon at fourpence the ounce, cloves at two pence, and pepper at twelve and sixteen pence the pound. Whereby we may see the sequel of things not always, but very seldom, to be such as is pretended in the beginning. The wares that they carry out of the realm are....

As we can see from the above, when sugar was half a crown for a pound, cinnamon was fourpence the ounce. Imported goods rose and fell with various import laws, but were eminently reasonable in price at all times. SUGAR WAS CHEAPER THAN CINNAMON, AND CINNAMON WAS CHEAP! Also, we can see that in relationship to other commodities, sugar has come down dramatically in price as well. This would perhaps account for all those description from foreign ambassadors about the English having bad teeth!

By the Elizabethian period, the best sugar was considered to be that of Madiera, with those of Barbary (Morocco) or the Canaries a close second.

**New World Sugars Feed Old World Wars**

During Drake's raid on Panama,1572-73, his crew went up a river at Magdelena called the Rio Grande and a few miles up it saw a Spaniard. When he saw they were English he ran off, and going ashore, they discovered, "many sorts of sweetmeats and conserves, with great store of sugar, being provided to serve the fleet returning to Spain." according to "Sir Francis Drake Revived" By Philip Nichols.

In 1579, the Golden Hind reached Ternate in the Moluccas (the Spice Islands). "The Sea King-Sir Francis Drake and His Times" tells us that Drake befriended Sultan Babu, and received "six tons of cloves" and "quantities of pepper, ginger, rice, bananas, and sugar cane."

Another Source, "Sir Francis Drake-The Queen's Pirate", says, "The king promised to send provisions to the ships, and he was as good as his word. There were rice, chickens, raw sugar, syrup, sugar cane..."

According to Drake himself, in "The World Encompassed", "we received what was there to be had in the way of traffic, to wit, rice in pretty quantity, hens, sugar canes, imperfect and liquid sugar...."

"...in November 1583 Mendoza" (Spanish ambassador to England) "wrote that the adventurers" (William and Richard Hawkins) "were home with a great booty, not only of pearls but of
treasure, hides and sugar, which he believed they had taken from Spanish ships." We have this from "The Age of Drake" by James Alexander Williamson.

In 1585, says "Francis Drake-The Lives of a Hero" of Drake from 2-11 October, "The fleet stayed in the Ria de Vigo, pillaging a few small vessels, including a French ship with sugar and wine from the Azores..."

**Sugar becomes Cheap**

These New World sugars put pressure on Venetian and Sicilian sugars, whose industries were ruined by cheap slave-produced sugar in the early 1600’s. Although sugar has become cheaper in the modern world, it was never too outrageous, as may been seen by TABLE 1. This table lists dates, locations and prices from 985 AD - 1558 AD. On TABLE 2, you will find a chart of the prices in England from 1259 AD - 1593 AD. Both charts are extracts from charts in Deere's monumental work, The History of Sugar. Deere notes that from 1401 AD - 1530 AD, sugar averaged 6.62 times the price of honey. Thus, while it was a bit expensive for peasants, it was easily available to Bughers and Merchant classes. And an item of no consequence to the Nobility. As sugar use increases the cancer and disease rate also increase.

Big sugar has a history of Death, Plague, Immune-deficiency, War, Slavery, Deceit, Cancer, Tooth decay, Obesity and is responsible for much of mankind’s most serious problems. Dextrose sugar has spread across the world doing harm and leaving a wake of disease in its path.
Why are these People so Healthy?

Native people eating traditional foods had physical excellence, splendid facial and dental arch forms, and no cavities.
Your Body Cells need Right Handed Sugar Dextrose Known as Glucose. Cancer cells feed on this Glucose. When we eat Dextrose like sucrose we feed the cells too fast, this produces disease and FEEDS THE CANCER cells. Fructose is a laevulose (left handed sugar) which needs conversion and stabilization to become glucose. Fructose in small amounts will Starve the Cancer
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From: A History of Food by Maguelonne Toussaint-Samat 1987, Translated by Anthea Bell 1992, Blackwell Publishers, Cambridge, MA we have:

"In 966 the newly created republic of Venice was already building a warehouse from which sugar was exported to Central Europe, the Black Sea and the Slav countries. The fate and fortune of Venice were founded on sugar and the trade in silks and spices."

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From: A History of Food by Maguelonne Toussaint-Samat 1987, Translated by Anthea Bell 1992, Blackwell Publishers, Cambridge, MA we have:

The Arabs installed the first 'industrial' sugar refinery on the island of Candia or Crete - its Arabic name, Qandi, meant 'crystallized sugar' - around the year 1000....The Arabs also invented caramel.....One of the first uses of caramel was as a depilatory for harem ladies.

============================================================================
Blackwell Publishers, Cambridge, MA we have:

"Around the twelfth century taxes paid on sugar made their first official appearance in the records of the South of France. The civic archives of Narbonne tell us that in 1153 a toll on sugar was introduced, called the lende: eight deniers per quintal if the goods arrived by sea, 14 deniers if they arrived by land. Marseilles instituted the lesde in 1228, and the Count of Provence added sugar to his toll tariff 25 years later. A distinction was drawn between sugar-loaves and powdered sugar.

Iran, who presumably learned it from India, brought rum to Europe for the first time via Marco Polo.

From: A History of Food by Maguelonne Toussaint-Samat 1987, Translated by Anthea Bell 1992, Blackwell Publishers, Cambridge, MA we have:

"Marco Polo, dictating his memoirs in his Genoese prison to his editor Rusticano of Pisa, mentioned among the many marvels of his book a beverage calculated to displease today's ayatollahs. 'They make very good wine of sugar, and many become drunk with it.' This was in the fourteenth century, and is the first recorded mention of rum.

It should be remembered that alcohol and alembic are words of Arabic origin, although the Koran forbade alcohol and all fermented drinks. The alembic was a still, and was already known to the author of the first part of the Roman de la Rose, Guillaume de Lorris, around 1236."

According to "The Monks of War" by Desmond Seward, 1972,

In the Jerusalem of the 1120's,

"Nobles wore turbans and shoes with upturned points, and the silks, damasks, muslins, and cottons that were so different from the wool and furs of France.....They ate sugar, rice, lemons, and melons...."


"Sugar and spices played an important part in food in the Middle Ages.....as early as the reign of Henry II sugar also was being imported to serve the purpose of sweetening.....by 1264 the price had dropped to 2s./lb....and by 1334 it could be bought for 7d.

Prices remained very similar to this until well into the sixteenth century, although the actual
figure depended on the degree of refinement. Very large amounts of sugar were used by the
royal household before the end of the thirteenth century (6,258 lb in 1288), and from then on
increasing amounts were imported. One ship alone, which entered Bristol from Lisbon in 1480,
carried nearly 10 tons."

(His sources are: L.F. Salzman, English Trade in the Middle Ages(1931), p. 417; Thorold Rogers
Agriculture and Prices , Vol 1. (1866) p. 633; E.M. Carus-Wilson(ed.), Overseas Trade of Bristol in
the Later Middle Ages (1937), pp.234-5.)

"Sugar was imported from all over the Mediterranean, as were the luxuries that an increasing
demand for sweet things encouraged. These included 'sugre candi' brought into London in 1421
from Italy, 'citonade' (candied lemon or orange peel) and large quantities of 'succade' (fruit
preserved in sugar syrup), the latter two both brought on one of the Venetian state galleys in
1481. Considerable amounts of treacle, as well as violet and rose sugar, were brought in too.
The sugars were more expensive than regular sugar and were partly used as medicine. Ordinary
sugar was available in varying degrees of fineness, although most of it came in the form of
'loaves', which varied in size from about 1 lb. to about 20 lb."

(His sources are: Salzman, English Trade in the Middle Ages(1931), p. 419; H.S. Cobb (ed.) ,
Overseas Trade of London: Exchequer Customs Accounts 1480-81 (1990), pp. 46-50)

"Spanish wine was imported widely throughout the whole of the Middle Ages. It's strength
particularly was appreciated, and in the sixteenth century it became tremendously popular. The
resulting increase in imports was in the form of what was designated 'sack' (or 'seck'), a wine
unknown until then. Sack seems to have been dry Spanish wine, given this name to
differentiate it from the sweeter wines from elsewhere, although the name was later extended
to wines from many other places-sherry sack, Madeira sack and Canary sack (this latter was
sometimes known as sweet sack) - all of which were imported. Sack was frequently drunk with
added sugar."

(His source: Simon, Wine Trade, Vol. 2, pp. 244-52; Wilson, Food and Drink, p. 340; Hieatt and
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Halyburton (1867), p. lxxiv.)

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THE CELY PAPERS
(The Cely Papers - Part I)
SELECTIONS FROM THE
CORRESPONDENCE AND MEMORANDA OF THE CELY FAMILY
MERchants OF THE STAPLE
A.D. 1475-1488
EDITED FOR THE ROYAL HISTORICAL SOCIETY
“The letters are full of commissions for the purchase of goods abroad, of various kinds. Goshawks, onion seed, Gascon wine, pickled Maas salmon, fur of 'boge' (lambskin), mink and other furs, 'chambering' (i.e., chamber hangings, tapestry) Holland cloth, saddles, stirrups, horse-furniture generally, armour, sugar loaves, salt fish, ginger, saffron, Louvain gloves, Calais packthread. For the purposes of their trade they bought Arras, Bergen (Mons), Elron (in Bretagne) and Normandy canvas for packing wool.

http://www.huntington.org/BotanicalDiv/Timeline.html
1531 A decree issued in Castile under the Spanish Crown allowed good terms for loans to allow purchase of slaves by settlers for establishment of sugar mills. (Thomas, 1999)
http://www.huntington.org/BotanicalDiv/Timeline.html
1541 A book to promote cooking with sugar was available in Venice. Later Nostradamus wrote the first French book on this topic. (Root, 1980)

http://www.huntington.org/BotanicalDiv/Timeline.html
1493 During Columbus’ second voyage he apparently introduced sugar cane to Santo Domingo; a settler named Aguilón was reported to have harvested cane juice by 1505 (Thomas, 1999). By 1516 the first processed sugar was shipped from Santo Domingo to Spain. Soon afterward, Portugal began importing sugar from Brasil. (Sugar cane would become the driving force for the slave trade.) Columbus also carried seed of lemon, lime, and the sweet orange to Hispaniola. He returned to Europe with pineapple. (Viola & Margolis, 1991)
The latest Public Service Announcement warning New Yorkers about the dangers of excessive soda consumption shows exactly how much sugar you might be inadvertently drinking.

Glucose and fructose are both simple sugars, but scientists have long suspected there are differences in the way your body processes them.

Scientist have known the simple differences but the lack of the scientific understanding of quantum physics with the sugar lobby groups hiding and twisting the truth is not readily available.

In a new study, researchers scanned the brains of nine subjects after they got an infusion of equal volumes of glucose, fructose or saline. The brain scans were looking at activity in the hypothalamus, a part of the brain which plays a key role in setting appetite levels and controlling production of metabolic hormones.
According to the Chicago Tribune:

“The researchers ... found that ‘cortical control areas’ -- broad swaths of gray matter that surrounded the hypothalamus -- responded quite differently to the infusion of fructose than they did to glucose. Across the limited regions of the brain they scanned ... glucose significantly raised the level of neural activity for about 20 minutes following the infusion. Fructose had the opposite effect, causing activity in the same areas to drop and stay low for 20 minutes after the infusion.”

Fructose or Laevulose sugar makes light revolve to the left. it must be converted to dextrose by the liver. This delay process stabilizes the blood sugar and prevents it from surging up and down. It is the surge up and down from dextrose sugar (the high glycemic reaction) that makes the disease causing nature of dextrose.

People everywhere are finally waking up to the indisputable fact that all simple sugars are not the same when it comes to the physical end results they create. The latest Public Service Announcement warning New Yorkers about the dangers of excessive soda consumption is a powerful illustration of this increasing level of awareness.

When these differences are understood, it’s easy to see how and why fructose—mainly in the form of high fructose corn syrup (HFCS)—is in large part responsible for the meteoric rise of obesity and its related health problems.

HFCS is a synthetic form of sugar that is used in large quantities by the food industry. The Dangers as usual come from the synthetic processed form. It is important to understand that fruits are not implicated nor is natural fruit sugar. Fruit is the base good food we need. But a synthetic form of fruit sugar coupled with the toxic form of corn waste is very bad and all of the deleterious of fructose come from the studies of HFCS. The sugar industry, or Big Sugar as we call it, try to confuse this issue and blame fructose for the dangers of HFCS.

HFCS is a staple ingredient in a vast majority of sweetened beverages and processed foods of all kinds, from pre-packaged meals to baked goods and condiments. And the number one source of calories in America is soda, in the form of HFCS!

Your Brain Reacts to Fructose and Glucose in Very Different Ways

This latest study is intriguing, as it shows that the difference between fructose and glucose is not just limited to how they're metabolized in your body; your brain also reacts to these two sugars in entirely different ways.
Nine healthy, normal-weight subjects received either glucose, fructose, or saline (as the control). Their brains were then scanned to evaluate activity around the hypothalamus, which is a key player in appetite control and production of metabolic hormones.

Interestingly, the researchers discovered that the "cortical control areas" surrounding the hypothalamus responded very differently to each substance:

- **Glucose** significantly raised the level of neural activity for about 20 minutes *thru hyperglycemic reactions followed by a one hour hypoglycemic low. Glucose sets up flux oscillations of sugar.*

- **HFCS Fructose** reduced neural activity in the area for about the same amount of time

- **Saline** had no effect on neural activity

- *None of these studies test natural fruit or natural fruit sugar*

So, what does this mean?

At this point, the implications of these differences are unclear. The Chicago Tribune reported that:

"At this point, said [lead researcher] Purnell in a phone interview, it means nothing more than that the two substances did prompt different responses in the brain--that the brain did not respond to them identically."

Within some of the "cortical control areas" where differences were seen, lie some important neural real estate, including regions where notions of reward and addiction are processed.

As scientists have a closer look in future studies, they should be able to zero in on which specific areas are affected differently by the two forms of sugar."

*There is really four forms of the sugar that need studied. Natural dextrose, natural fructose and there two synthetic processed form.*

So, time will tell what these latest findings really mean, but we already know that fructose has a detrimental impact on two hormones involved with satiety and hunger, namely leptin and ghrelin, and that this influence sets in motion a vicious cycle of hunger, increased food intake, and increased fat storage.

**HFCS Fructose Packs on the Pounds Faster than Any Other Nutrient**
Part of what makes HFCS so unhealthy is that it is metabolized to fat in your body far more rapidly than any other sugar. The entire burden of metabolizing fructose falls on your liver, and it promotes a particularly dangerous kind of body fat, namely adipose fat. This is the fat type of fat that collects in your abdominal region and is associated with a greater risk of heart disease.

Additionally, because most fructose is consumed in liquid form (i.e. soda and sweetened beverages of all kinds), its negative metabolic effects are magnified. Because while HFCS has about the same amount of fructose as cane sugar, the fructose in HFCS is in its "free" form and not attached to any other carbs.

The fructose in fruits and in cane sugar is bonded to other sugars which results in a decrease in its metabolic toxicity.

Consuming foods that contain high amounts of HFCS fructose is, to put it bluntly, the fastest way to trash your health. Among the health problems you invite with a high-HFCS fructose diet are:

- Obesity, insulin resistance, metabolic syndrome and type 2 diabetes
- Elevated triglycerides and LDL (bad) cholesterol levels
- Elevated blood pressure
- Liver disease
- Depletion of vitamins and minerals—Unbound fructose, found in large quantities in HFCS, can interfere with your heart's use of minerals such as magnesium, copper and chromium.
- Cardiovascular disease, arthritis, gout, and cancer

Adding insult to injury, HFCS is most often made from genetically modified (GM) corn, which is fraught with its own well documented side effects and health concerns, from an increased risk of developing food allergies to the risk of increased infertility in future generations.

**Beware: Mixing HFCS Fructose with Glucose Increases Destructive Effect**

HFCS Fructose consumption clearly causes insulin resistance whereas straight glucose does not. However, it's worth knowing that glucose accelerates fructose absorption! So
when you mix glucose and fructose together, you absorb more fructose than if you consumed fructose alone...

This is an important piece of information if you are struggling to control your weight.

Remember, sucrose, or table sugar, is exactly this blend -- fructose plus glucose. So, the key to remember is to not get too nit-picky about the names of the sugars. ALL of these contribute to decreased health:

- Sucrose (table sugar)
- Corn syrup
- High fructose corn syrup (HFCS) This is a synthetic food product not occurring in nature and it is a ploy to make you sick and addicted to eating
- Crystalline fructose, and any other high-fructose sweetener they may dream up
- Natural fructose in the form of fruits, fruit juices, and natural sweeteners such as honey and agave. This category is only detrimental at large excessive use. There are fruitarian who live on the Karmic free diet of only fruit and the show no such deleterious diseases. No scientific evidence has ever shown deleterious effects from naturally occurring fruit fructose.

Is Fructose from HFCS Worse than Fructose from Table Sugar?

High fructose corn syrup is about 55 percent fructose while table sugar is about 50 percent. The fructose in the corn syrup is also dissociated from the glucose, unlike table sugar which has it attached. So HFCS is clearly worse than table sugar, but not orders of magnitude. It is only marginally worse.

The MAIN reason why fructose and HFCS are so bad is that in the mid 70s two things happened. Earl Butz changed the US Agriculture policy to massively subsidize corn production in the US, and scientists also figured out how to make HFCS in the lab from corn. Nothing happened to fruit in the 70s and this statement is deceptive. What did happen in the 70s was the development of synthetic High fructose corn syrup to get rid of the extra unused inedible corn surplus.

The combination of these two events made high fructose corn syrup VERY cheap. So cheap that it's put in virtually all processed foods because it is virtually free and massively improves the flavor of most foods. So if you are a processed food producer
there are virtually no downsides. *It also fools the brain into not recognizing it is hungry and thus your hunger continues after eating thus selling more product*.

So it becomes a QUANTITY issue, and the average person is now consuming 600 percent more than their ancestors did, and some are consuming 1500 percent more. So the *massive increase* in this toxin is what is causing the problem. If table sugar was as cheap and used as much it would cause virtually identical side effects.

**Fructose Metabolism Basics**

Without getting into the very complex biochemistry of carbohydrate metabolism, it is important to understand how your body processes glucose versus fructose. Dr. Robert Lustig, Professor of Pediatrics in the Division of Endocrinology at the University of California, has been a pioneer in decoding sugar metabolism. His work has highlighted some major differences in how different sugars are broken down and used.

Here's a summary of the main points:

- After eating fructose, 100 percent of the metabolic burden rests on your liver as it should be for proper detox. With glucose, your liver has to break down only 20 percent.

- Every cell in your body, including your brain, utilizes glucose. Therefore, much of it is "burned up" immediately after you consume it. By contrast, excess large consumption of HFCS fructose is turned into free fatty acids (FFAs), VLDL (the damaging form of cholesterol), and triglycerides, which get stored as fat.

- The fatty acids created during fructose metabolism accumulate as fat droplets in your liver and skeletal muscle tissues, causing insulin resistance and non-alcoholic fatty liver disease (NAFLD). Insulin resistance progresses to metabolic syndrome and type II diabetes.

- Fructose is the most lipophilic carbohydrate. In other words, fructose converts to activated glycerol (g-3-p), which is directly used to turn FFAs into triglycerides. The more g-3-p you have, the more fat you store. Glucose does not do this.

- When you eat 120 calories of glucose, less than one calorie is stored as fat. 120 calories of fructose results in 40 calories being stored as fat. **Consuming fructose is essentially consuming fat!**

- The metabolism of fructose by your liver creates a long list of waste products and toxins, including a large amount of uric acid, which drives up blood pressure and causes gout.
Glucose suppresses the hunger hormone ghrelin and stimulates leptin, which suppresses your appetite. Fructose has no effect on ghrelin and interferes with your brain's communication with leptin, resulting in overeating.

So, if anyone tries to tell you "sugar is sugar," they are way behind the times. Anyone telling you fruit is bad is using illogic. As you can see, there are major differences in how your body processes each one. The bottom line is: fructose leads to increased belly fat, insulin resistance and metabolic syndrome -- not to mention the long list of chronic diseases that directly result.

If you, like so many others, have struggled with your weight for years; examined your diet; avoided fat and counted your calories, yet not getting anywhere and wondering what you’re doing wrong, please pay very close attention to this issue!

In many cases the primary culprit is an excessive intake of hidden sugar in the form of excess fructose, whether natural fructose (such as agave syrup or 100 percent fruit juice, for example), or in the form of corn syrup (or high fructose corn syrup), which is a main ingredient in countless beverages and processed, pre-packaged foods.

It’s extremely easy to consume high amounts of fructose on a daily basis, especially if most of your foods are processed in any way, or if you drink sodas or any other sweetened beverages such as ice-teas, fruit juices and sports drinks. As previously discussed, even seemingly "health-conscious" beverages like Vitamin Water, Jamba Juice and Odwalla SuperFood contain far more added sugar and/or fructose than many desserts!

So please, understand that it’s not dietary fat that's making you fat. It's fructose.

**My Recommended Fructose Allowance**

As a standard recommendation, I strongly advise keeping your TOTAL fructose consumption below 25 grams per day.

*My recommendation is to avoid any and all synthetic and processed sugars and to use fruits freely and dilute all fruit juices to taste (50% water a minimum). Avoid all HFCS and glucose sodas. An apple a day keeps the doctor away. But you can overdose on anything. The idea of 25 grams is a good one for if you eat over 25 grams you eat to excess and the extra fructose goes to fat. But it is not 25 grams a day but 25 grams at a time. If you wait four hours your liver can tolerate another 25 grams. For small people or children even 25 at a time might be too much. So to play it safe use 15-20 grams of fructose (mostly fruit with the fiber) at a time wait*
four or more hours for the next 15-20 and no more than three a day. So a maximum of 60 grams of fructose from and only from natural fruits and juices.

So fruit can be eaten and we can eat 15-20 grams easily at a time even three times a day but no more. If there is no other liver burden and there is good exercise fruit is good.

**The old key of a minimum of five servings of fruits and veg per day is still the way to go.**

For most people it would also be wise to limit your fructose from fruit to **15 grams or less**, as you're virtually guaranteed to consume "hidden" sources of fructose if you drink beverages other than water and eat processed food. Remember, the average **12-ounce can of soda** contains 40 grams of sugar, at least half of which is fructose, so one can of soda ALONE would exceed your daily allotment.

Fifteen grams of fructose is not much -- it represents two bananas, one-third cup of raisins, or two Medjool dates. In his book, *The Sugar Fix*, Dr. Johnson includes detailed tables showing the content of fructose in different foods -- an information base that isn't readily available when you're trying to find out exactly how much fructose is in various foods. I encourage you to pick up a copy of this excellent resource.

Here's a quick reference list of some of the most common fruits that you can use to help you count your fructose grams:

<table>
<thead>
<tr>
<th>Fruit</th>
<th>Serving Size</th>
<th>Grams of Fructose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limes</td>
<td>1 medium</td>
<td>0</td>
</tr>
<tr>
<td>Lemons</td>
<td>1 medium</td>
<td>0.6</td>
</tr>
<tr>
<td>Cranberries</td>
<td>1 cup</td>
<td>0.7</td>
</tr>
<tr>
<td>Passion fruit</td>
<td>1 medium</td>
<td>0.9</td>
</tr>
<tr>
<td>Prune</td>
<td>1 medium</td>
<td>1.2</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Fruit</th>
<th>Serving Size</th>
<th>Grams of Fructose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boysenberries</td>
<td>1 cup</td>
<td>4.6</td>
</tr>
<tr>
<td>Tangerine/mandarin orange</td>
<td>1 medium</td>
<td>4.8</td>
</tr>
<tr>
<td>Nectarine</td>
<td>1 medium</td>
<td>5.4</td>
</tr>
<tr>
<td>Peach</td>
<td>1 medium</td>
<td>5.9</td>
</tr>
<tr>
<td>Orange (navel)</td>
<td>1 medium</td>
<td>6.1</td>
</tr>
<tr>
<td>Fruit</td>
<td>Quantity</td>
<td>Weight</td>
</tr>
<tr>
<td>-----------------------</td>
<td>----------</td>
<td>--------</td>
</tr>
<tr>
<td>Apricot</td>
<td>1 medium</td>
<td>1.3</td>
</tr>
<tr>
<td>Guava</td>
<td>2 medium</td>
<td>2.2</td>
</tr>
<tr>
<td>Date (Deglet Noor style)</td>
<td>1 medium</td>
<td>2.6</td>
</tr>
<tr>
<td>Cantaloupe</td>
<td>1/8 of med. melon</td>
<td>2.8</td>
</tr>
<tr>
<td>Raspberries</td>
<td>1 cup</td>
<td>3.0</td>
</tr>
<tr>
<td>Clementine</td>
<td>1 medium</td>
<td>3.4</td>
</tr>
<tr>
<td>Kiwifruit</td>
<td>1 medium</td>
<td>3.4</td>
</tr>
<tr>
<td>Blackberries</td>
<td>1 cup</td>
<td>3.5</td>
</tr>
<tr>
<td>Star fruit</td>
<td>1 medium</td>
<td>3.6</td>
</tr>
<tr>
<td>Cherries, sweet</td>
<td>10</td>
<td>3.8</td>
</tr>
<tr>
<td>Strawberries</td>
<td>1 cup</td>
<td>3.8</td>
</tr>
<tr>
<td>Cherries, sour</td>
<td>1 cup</td>
<td>4.0</td>
</tr>
<tr>
<td>Pineapple</td>
<td>1 slice (3.5” x .75”)</td>
<td>4.0</td>
</tr>
<tr>
<td>Grapefruit, pink or red</td>
<td>1/2 medium</td>
<td>4.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fruit</th>
<th>Quantity</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Papaya</td>
<td>1/2 medium</td>
<td>6.3</td>
</tr>
<tr>
<td>Honeydew</td>
<td>1/8 of med. melon</td>
<td>6.7</td>
</tr>
<tr>
<td>Banana</td>
<td>1 medium</td>
<td>7.1</td>
</tr>
<tr>
<td>Blueberries</td>
<td>1 cup</td>
<td>7.4</td>
</tr>
<tr>
<td>Date (Medjool)</td>
<td>1 cup</td>
<td>7.7</td>
</tr>
<tr>
<td>Apple (composite)</td>
<td>1 medium</td>
<td>9.5</td>
</tr>
<tr>
<td>Persimmon</td>
<td>1 medium</td>
<td>10.6</td>
</tr>
<tr>
<td>Watermelon</td>
<td>1/16 med. melon</td>
<td>11.3</td>
</tr>
<tr>
<td>Pear</td>
<td>1 medium</td>
<td>11.8</td>
</tr>
<tr>
<td>Raisins</td>
<td>1/4 cup</td>
<td>12.3</td>
</tr>
<tr>
<td>Grapes, seedless (green or red)</td>
<td>1 cup</td>
<td>12.4</td>
</tr>
<tr>
<td>Mango</td>
<td>1/2 medium</td>
<td>16.2</td>
</tr>
<tr>
<td>Apricots, dried</td>
<td>1 cup</td>
<td>16.4</td>
</tr>
<tr>
<td>Figs, dried</td>
<td>1 cup</td>
<td>23.0</td>
</tr>
</tbody>
</table>

The Way Toward Better Health Begins Here...

There is nothing benign about the fructose consumption inherent in our modern diet. It is literally supercharged with fructose, and we're seeing the consequences of this type of eating in our skyrocketing rates of obesity, diabetes, heart disease, and cases of non-fatty liver disease.

Fortunately, there's plenty of good news here.
There IS a way out of this evil circle, and that is a return to a more holistic diet based on whole foods, along with physical exercise and safe sun exposure to optimize your vitamin D levels.

One of the easiest things you can do to quickly improve your health is to eliminate all soda and sweetened beverages from your life. I say ALL soda, because even though HFCS is clearly something you want to avoid, it is still not as bad as artificial sweeteners, which damage your health even more rapidly than HFCS.

Then, since most processed foods also contain HFCS, avoiding as many processed foods as possible is your next step.

If you want an occasional sweetener, I recommend using:

1. The herb stevia
2. Dextrose (pure glucose)  I discourage this in any form as it upsets blood balance
3. use fruit as sweetener

I do not recommend agave syrup since it is a highly processed sap that is almost all fructose. It is one of the more seriously mislabeled foods in the natural food world. We actually did an informal study and found the most popular agave brands ranged from 59 to 67 percent pure fructose, far worse than HFCS.

Once you realize the hazards of fructose and begin to avoid it in earnest, your diet will significantly improve, which is an essential factor for a long, healthy life.

Sugars and Sweetness

Many diseases are due to factors that are related to Big Sugar, Big Sugar for its corporate name. As people who get bad sugars and bad oils, trans-fatty acids and cooked oils. Factors of bad nutrition in America are making people sick, producing blood sugar problems, producing obesity, cardiovascular problems, and many, many things that the FDA could also affect. Limiting trans-fatty acids, making good sugars (Left handed Fructose), rather than bad sugars (right handed Dextrose).

The body needs right handed sugar (Blood Glucose) to enter the cell for energy. Right handed dextrose sugars such as sugar cane, beet sugar, grape sugar, corn sugar are right handed and they
enter the cells too fast. This produces fat more easily, hyperglycemia (mild addiction) and then hypoglycemia (mild depression). This puts a burden on the pancreas and all other organs. There is also a well documented negative effect on the immune system from dextrose. If you use chemicals to strip away vitamins and minerals to make the sugar white, and it gets even worse.

Dextrose sugars are at the top of the Glycemic Index tables because they enter the blood stream and the cell so fast. Thus they are the main cause of obesity and all blood sugar disorders.

Fructose (levulose) revolves to the left and needs to be converted to the right. A process that takes time and thus allows for a more smooth delivery of the glucose. Less fat, less stress on organs, less craving, less depression, less blood sugar fluctuations. More hormonal and enzyme production thus it is an anti-aging therapy. Use fresh fruits as a sweetener; it will change your life.

Crazy food additives that have not been fully tested add to the food and drug problems. The synthetic foods and drugs have failed. Our society has learned to avoid and mistrust synthetic foods. We will not order them on a menu or buy them of the shelf. We have learned to be chemophobic. We know that synthetic foods create cancer and disease. Our society must learn that this is true of our medicines as well.

Our body needs good fatty acids. They make up the cell membrane of all of our cells. Stress sets them free. Cooking destroys most fatty acids. Meat and potatoes contain very little. In fact the fatty acids from an animal are saturated. Fresh and raw vegetable and unheated vegetable juice are the best source. Cooking oils destroys some of their nutritional value. Stress makes us fatty acid deficient. So fatty acid deficiency is the number one problem in the world of health care today.

People are made to be mostly vegetarian. Humans are not carnivores. But we are omnivores and some meat is good for the diet. Vegetarians will have to be careful and eat right and supplement to be healthy. As vegetarians we should mostly eat fruits and other foods that carry seeds. If we eat an apple, the apple tree does not die. In fact it wants us to eat its fruits and carry the seeds elsewhere. Fruits have no bad karma. Eating a cow has karma the cow must die. Eating a carrot has bad karma the carrot must die. But eating fruits have no bad karma.

We all have the instinct to like sweets for the reason to eat fruits (fructose). Our tongues are mainly proton detectors and sweet fruits the primary thing we crave for taste and health. But then came along the sugars from cane and other dextrose sugars that are problems for the body. The high glycemic foods with dextrose bring up blood sugar very fast we get addicted to the taste and the rush. And our sense of taste for fruit gets perverted to seek dextrose sugars. The high glycemic dextrose sugars drive out blood sugar way up, force the release of extra insulin, this makes the blood sugar go down and the cycle repeats. Immune-depression, nerval-irritation, stress susceptibility, mood disorders and the cycle allows all other diseases and cancer a foothold.
Downward Spiral

Blood sugar

Stress produces excess Cortisol, weakens adrenals, produces excess blood sugar, excess insulin, this makes you crave foods and eat more which increases blood sugar and insulin, which increase cortisol make you irritable and more sensitive to the next stressor.

Insulin

Cortisol

All Disease are more prevalent

Your Blood Glucose Level Changes When You Eat

Blood Glucose Goals:

- 4 to 7 before meals
- 10 or less after meals

Blood Glucose Levels to Aim for:

- Before any meal: 4.0 - 7.0 mmol/L
- 2 hours after any meal: 5.0 - 10.0 mmol/L
Bad food is a problem in degenerative disease. And this is also another industry the FDA is not attacking that the FDA is not doing their job to protect the human beings of America. Big Sugar and cholesterol are leading to diseases that are killing over a million people a year.

"Well all we have to do is follow the candy and sugar holidays to sell our Flu shots and Drugs to the People, They will never believe that sugar weakens their immune systems. They believe what we tell them to believe."
For most of the history of man there was little meat consumption. Killing the pig was a yearly or semi yearly celebration. People mostly ate fruits and vegetables. Only the rich king could eat pig everyday and when he did he got sick. There is pig toxins that are harmful. As people got more affluent they ate more pig and ate more of the foods that in old were only used sparingly. But now that people eat them every day they are getting the diseases that used to be the King diseases.

Food is the source of the compounds that make us what we are. You are what you eat. The shift of sugars to dextrose was a major mistake for health care, The improper use of cooking and the destruction of the oils, too much meat consumption, too much processed foods, profits from fast foods, leaching of minerals and nutrients from the soil, lack of appreciation for the natural, all disobey the rules of the stomach and a medical system that believes it can fix anything when it can’t, and we have a society where the diseases are rampant. Most disease has nutritional imbalance at it’s root.

Nutritional problems
1. Dextrose not Fructose
2. too much meat
3. leaching of the soil of nutrients and minerals
4. disobey the rules of the stomach
5. SINthetic foods
6. Allopathy
7. too much cooking
8 Profit over People
9. Addiction to foods
10. Lack of maturity and vision
High Glycemic Index = Disease
Sweetness travels under a variety of aliases. Just check out the label of your favorite cereal or beverage and you’re likely to see the flavor show up many times, in the form of high-fructose corn syrup, dextrose, cane syrup, maple syrup, fructose, molasses, honey—and even agave, the latest caloric sweetener, which is derived from a plant native to Mexico. (These are all in addition, of course, to plain old table sugar, or dextrose sucrose.)

You might also find some food labels or manufacturers hinting that their source of sweetness is more healthful than the others. Since the concept of “healthy” can be awfully fuzzy, let’s put it bluntly. “All of these are empty calories that offer you no relative nutrition,” says Dawn Jackson Blatner, a dietitian and spokesperson for the American Dietetic Association. That doesn’t mean they’re forbidden, just that they should be eaten in moderation, she says.

And many of us are not moderate in our consumption of added sugars. The World Health Organization recommends that we cap our intake at less than 10 percent of our day’s calories, yet the average American gets 400 calories a day from beverages, a lot of which come from sugar. (Many people, including obesity expert Barry Popkin, say one of the easiest ways to drop weight is to simply cut out all caloric beverages.) Assuming you take in 1,800 calories per day, a 10 percent
limit translates to fewer than 180 calories, or 45 grams, of sugar daily. The real problem of dextrose versus fructose has not been really discussed because of the problem of the profits of Big Sugar, and their lobbyists.

So if you are following WHO's guidance and eating a moderate amount of the sweet stuff, does it matter what form it takes? Some hypothesize that fructose, one of the components of sucrose, is a particularly bad kind of sugar. It may not suppress hunger or stimulate the natural feeling of fullness, says Kathleen Melanson, an assistant professor of food and nutrition at the University of Rhode Island in Kingston. And there is also a concern that when it's consumed in very high amounts, fructose can't be properly processed by the body, which translates to a fatty liver or raised levels of triglycerides in the blood. It can also lead to higher levels of uric acid, which some believe raises the risk of cardiovascular disease and diabetes, among other woes. So fructose cannot be used to excess either. Dilute the 100% natural juices you buy and use sugar sparingly even fructose.

But those hypotheses have not been proven, emphasizes Melanson, and there's no take-home message for people in terms of the form of sugar they eat. Some mass production of white sucrose leaves less than 20% fructose. The mass denaturalization of sugar is to remove the brown color and make it white. This was important over a hundred years ago as a social issue not a health issue. The use of mustard and nerve gases to strip away the minerals and nutrients that yield the color, all designed to make WHITE sugar, white Flour for a White biased society.

Sucrose is normally about 30% fructose and 70% glucose, while honey is about 40 to 45 percent fructose, and high-fructose corn syrup is about 55 percent. Unprocessed honey has lots of minerals and vitamins to support energy production. The amount of fructose in agave nectar can vary, with estimates starting at about 60 or 75 percent (some say it's much higher, depending on the processing method). Fructose in the supermarket is still at best only 90% fructose.

There are tiny differences in the minerals in some sweeteners; the less processed, the more trace minerals, says Blatner. (Honey, for example, has some magnesium and calcium.) And there is some evidence that the levels of antioxidants in sweeteners can vary. One study, published earlier this year in the Journal of the American Dietetic Association, found that among sweeteners, dark and blackstrap molasses had the most antioxidant activity. Maple syrup, brown sugar, and honey had a bit less, and refined sugar, corn syrup, and agave nectar had the least.

Still, it usually comes down to personal taste and preference, Blatner says. Some find agave so sweet that they use much less of it, which can mean fewer calories. Others find the taste of molasses vile. It's up to you. Importantly, you shouldn't let any fructose worries scare you away from fruit; while it's true that tree fruits and berries contain a large percentage of fructose, the absolute amount is quite low, Melanson says. And it comes packaged with plenty of fiber and nutrients, which is more you can say for your average sweetened cereal or drink. Use fruit to satisfy you sweet tooth.

The sweet tooth or sugar craving is most often a sign of some disease. A weak or clogged gall bladder will create this. A blood sugar imbalance will also make this craving. Addiction to the glycemic rush of white sugar is a factor. Nerve damage, intestinal parasites, psychological imbalance also can be the cause of aggravate. If you were lost in the desert for 3 days and just came out and someone offered you an apple, you wouldn't say "No, have you got a candy bar." If the apple does not fit your hunger, you are not hungry you are addicted. Use fruit to satisfy you sweet tooth.
The unhealthy foods are on the top of the pyramid. Make most of your diet the bottom 2 rows.

The top row has too much dextrose and too little vitamins and minerals. Row 1 and row 2 make fat quickly and lower the immune system. Avoid row 1, and limit row 2.

The bottom row is the healthiest, rich in minerals and vitamins with fructose or levulose sugar for stable energy. You make more hormones with fructose than with dextrose. The bottom 2 rows limit disease and foster good health. The quick fix sugars of row 1 do not last and they upset the blood stability. They can cause or aggravate every disease known.

Low Glycemic Food List
Low glycemic food is very important for the weight loss plans that you have been trying to work on. Check out the low glycemic food list given below.
The glycemic index of the food is the numerical index that categorizes the carbohydrates according to their response to the glucose from the human body. It scales from 0 to 100, the higher the GI (Glycemic Index) count, the higher is the blood sugar counts. Glycemic index is usually counted by feeding a fixed portion of food to the test subject after an overnight fast and then calculating the blood sugar counts. The GI count is the best method to lower the blood glucose levels as well as the body weight.

**Low Glycemic Index**
More than 80% patients of type 2 diabetes suffer from obesity and high cholesterol levels. Eating low Glycemic food is very helpful for the overall health of a person. It helps a person to control the body weight, increase the insulin resistance, lower the risk factors of heart diseases and Polycystic Ovarian Syndrome (PCOS), maintain normal cholesterol levels, reduce craving for food, prolong physical endurance and retain the carbohydrate counts after a rigorous exercise.

However, it doesn't mean that all the high glycemic foods must be avoided because those who are not suffering from diabetes, may need a rapid increase in the blood sugar levels. This is the reason why many physical trainers advice the players to have high GI food immediately after a tiring workout or any other physical activity. More on glycemic index food list.

**Low glycemic diet plan** is actually a diet plan that a person needs to follow at least for 28 days, which will help him/her maintain the proper blood glucose levels. Low glycemic index diet generally consists of proteins, low glycemic carbohydrates and omega-3 fatty acids. After following this diet plan for a month, the person can either switch to a balanced diet plan or continue with the same GI diet: low glycemic index foods. Is there any low glycemic food list that one can follow for better results? Yes, given below is a list of low glycemic index foods that you can refer in order to manage your daily diet.

**Low Glycemic Index Food List: Vegetables**
<table>
<thead>
<tr>
<th>Name</th>
<th>Glycemic Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Artichoke</td>
<td>15</td>
</tr>
<tr>
<td>Asparagus</td>
<td>15</td>
</tr>
<tr>
<td>Broccoli</td>
<td>15</td>
</tr>
<tr>
<td>Cauliflower</td>
<td>15</td>
</tr>
<tr>
<td>Celery</td>
<td>15</td>
</tr>
<tr>
<td>Cucumber</td>
<td>15</td>
</tr>
<tr>
<td>Eggplant</td>
<td>15</td>
</tr>
<tr>
<td>Green Beans</td>
<td>15</td>
</tr>
<tr>
<td>Lettuce</td>
<td>15</td>
</tr>
<tr>
<td>Peppers</td>
<td>15</td>
</tr>
<tr>
<td>Snow Peas</td>
<td>15</td>
</tr>
<tr>
<td>Spinach</td>
<td>15</td>
</tr>
<tr>
<td>Summer squash</td>
<td>15</td>
</tr>
<tr>
<td>Tomatoes</td>
<td>15</td>
</tr>
<tr>
<td>Soy beans</td>
<td>15</td>
</tr>
<tr>
<td>Dried peas</td>
<td>22</td>
</tr>
<tr>
<td>Boiled beans</td>
<td>16</td>
</tr>
<tr>
<td>Boiled kidney beans</td>
<td>29</td>
</tr>
<tr>
<td>Boiled lentils</td>
<td>29</td>
</tr>
<tr>
<td>Zucchini</td>
<td>15</td>
</tr>
<tr>
<td>Chickpeas</td>
<td>33</td>
</tr>
<tr>
<td>Name</td>
<td>Glycemic Index</td>
</tr>
<tr>
<td>---------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Black-eyed beans</td>
<td>41</td>
</tr>
<tr>
<td>Boiled haricot beans</td>
<td>38</td>
</tr>
<tr>
<td>Carrots</td>
<td>39</td>
</tr>
<tr>
<td>Yam</td>
<td>51</td>
</tr>
<tr>
<td>Sweet potato</td>
<td>54</td>
</tr>
<tr>
<td>Onions</td>
<td>10</td>
</tr>
<tr>
<td>Cabbages</td>
<td>10</td>
</tr>
</tbody>
</table>

**Low Glycemic Index Food List: Fruits**

<table>
<thead>
<tr>
<th>Name</th>
<th>Glycemic Index</th>
</tr>
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<tbody>
<tr>
<td>Apples</td>
<td>38</td>
</tr>
<tr>
<td>Apricots (dried)</td>
<td>31</td>
</tr>
<tr>
<td>Avocados</td>
<td>44</td>
</tr>
<tr>
<td>Cherries</td>
<td>22</td>
</tr>
<tr>
<td>Grapefruit</td>
<td>25</td>
</tr>
<tr>
<td>Grapes</td>
<td>46</td>
</tr>
<tr>
<td>Kiwi fruit</td>
<td>53</td>
</tr>
<tr>
<td>Bananas</td>
<td>54</td>
</tr>
<tr>
<td>Pear</td>
<td>38</td>
</tr>
<tr>
<td>Plum</td>
<td>39</td>
</tr>
<tr>
<td>Peach</td>
<td>42</td>
</tr>
<tr>
<td>Oranges</td>
<td>44</td>
</tr>
</tbody>
</table>
### Low Glycemic Index Food List: Cereals

<table>
<thead>
<tr>
<th>Name</th>
<th>Glycemic Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>All bran</td>
<td>42</td>
</tr>
<tr>
<td>Porridge</td>
<td>49</td>
</tr>
<tr>
<td>Pearl barley</td>
<td>25</td>
</tr>
<tr>
<td>Rye</td>
<td>34</td>
</tr>
<tr>
<td>Wheat kernels</td>
<td>41</td>
</tr>
<tr>
<td>Parboiled rice</td>
<td>48</td>
</tr>
<tr>
<td>Cracked barley</td>
<td>50</td>
</tr>
</tbody>
</table>

### Low Glycemic Index Food List: Others

<table>
<thead>
<tr>
<th>Name</th>
<th>Glycemic Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole grain bread</td>
<td>50</td>
</tr>
<tr>
<td>Multi grain bread</td>
<td>48</td>
</tr>
<tr>
<td>Low fat yogurt</td>
<td>14</td>
</tr>
<tr>
<td>Chocolate milk</td>
<td>24</td>
</tr>
<tr>
<td>Fat free milk</td>
<td>32</td>
</tr>
<tr>
<td>Whole milk</td>
<td>27</td>
</tr>
<tr>
<td>Skimmed milk</td>
<td>32</td>
</tr>
<tr>
<td>Low fat ice cream</td>
<td>50</td>
</tr>
<tr>
<td>Soy milk</td>
<td>31</td>
</tr>
<tr>
<td>Peanuts</td>
<td>15</td>
</tr>
<tr>
<td>Food Item</td>
<td>Glycemic Index</td>
</tr>
<tr>
<td>--------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Marmalades and jams</td>
<td>49</td>
</tr>
<tr>
<td>Canned tomato soup</td>
<td>38</td>
</tr>
<tr>
<td>Chocolate bar</td>
<td>49</td>
</tr>
<tr>
<td>Macaroni</td>
<td>45</td>
</tr>
<tr>
<td>Spaghetti</td>
<td>41</td>
</tr>
<tr>
<td>Fettuccine</td>
<td>32</td>
</tr>
<tr>
<td>Vermicelli</td>
<td>35</td>
</tr>
<tr>
<td>Pound cake</td>
<td>54</td>
</tr>
</tbody>
</table>

Along with the proper ratio of the above mentioned low glycemic foods, one must also concentrate on a low carb diet that will be helpful to maintain the low glycemic index. Relatively less amount of oil, salad dressings, mayonnaise, fresh fruits and green vegetables, cereals and beans and low fat dairy items always top the low glycemic food list. One might also like to consider this glycemic index chart before opting for a healthy diet. Hope you found this article about low glycemic index food list, useful! Take care!

By Rutuja Jathar
Published: 9/18/2009
<table>
<thead>
<tr>
<th>Category</th>
<th>Avoid the Foods in Red</th>
<th>Eat the Foods in Green</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nuts</td>
<td>Contain nuts or seeds</td>
<td>Nut free</td>
</tr>
<tr>
<td>Beans</td>
<td></td>
<td>Bean free</td>
</tr>
<tr>
<td>Vegetables</td>
<td></td>
<td>Veggie free</td>
</tr>
<tr>
<td>Fruits</td>
<td></td>
<td>Fruit free</td>
</tr>
<tr>
<td>Grains</td>
<td></td>
<td>Grain free</td>
</tr>
<tr>
<td>Sugars</td>
<td></td>
<td>Sugar free</td>
</tr>
<tr>
<td>High Glycemic Foods</td>
<td></td>
<td>Medium Glycemic Foods</td>
</tr>
<tr>
<td>Low Glycemic Foods</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Blood sugar

1. Stomach converts food to glucose
2. Glucose enters bloodstream
3. Pancreas produces insulin
4. Glucose enters body effectively
5. Glucose levels in balance
The fluctuation of blood sugar (red) and the sugar-lowering hormone insulin (blue) in humans during the course of a day with three meals. One of the effects of a sugar-rich vs a starch-rich meal is highlighted.

The blood sugar concentration or blood glucose level is the amount of glucose (sugar) present in the blood of a human or animal. Normally, in mammals the body maintains the blood glucose level at a reference range between about 3.6 and 5.8 mM (mmol/L). It is tightly regulated as a part of metabolic homeostasis.

Glucose is primarily a compact energy store, and is the primary source of energy for body cells, fats and oils (ie, lipids). It is transported from the intestines or liver to body cells via the bloodstream, and is absorbed by body cells with the intervention of insulin, which is a hormone normally naturally produced by the body.

The mean normal blood glucose level in humans is about 10 mM (10 mmol/L or 140 mg/dL) (since the molecular weight of glucose, C₆H₁₂O₆, is about 180 g/mol). However, the glucose level fluctuates during the day. It rises after meals for an hour or two by a few grams and is usually lowest in the morning, before the first meal of the day (termed “the fasting level”). The total amount of glucose normally in human blood is only about 3.3 to 7g (assuming an ordinary adult blood volume of 5 litres, plausible for an average adult male).

When a blood sugar level is outside the normal range, it may be an indicator of a medical condition. A persistently high level is referred to as hyperglycemia or if low as hypoglycemia. Diabetes mellitus is characterized by persistent hyperglycemia from any of several causes, and is the most prominent disease related to failure of blood sugar regulation. A temporary elevated blood sugar level may also result from severe stress, such as trauma, stroke, heart attack, or surgery; and also from illness. Alcohol, after an initial surge in blood sugar, tends to cause blood sugar to fall. Also, certain drugs can increase or decrease glucose levels.
If blood sugar levels drop too low, a potentially fatal condition called hypoglycemia develops. Symptoms may include lethargy, impaired mental functioning, irritability, shaking, weakness in arm and leg muscles, sweating and loss of consciousness. Brain damage is even possible.

If levels remain too high, appetite is suppressed over the short term. Long-term hyperglycemia causes many of the long-term health problems associated with diabetes, including eye, kidney, heart disease and nerve damage.

**Low blood sugar**

Some people report drowsiness or impaired cognitive function several hours after meals, which they believe is related to a drop in blood sugar, or "low blood sugar". For more information, see:

- idiopathic postprandial syndrome
- hypoglycemia

Mechanisms which restore satisfactory blood glucose levels after hypoglycemia must be quick and effective, because of the immediately serious consequences of insufficient glucose; in the extreme, coma, but also less immediately dangerous, confusion or unsteadiness, amongst many other symptoms. This is because, at least in the short term, it is far more dangerous to have too little glucose in the blood than too much. In healthy individuals these mechanisms are generally quite effective, and symptomatic hypoglycemia is generally only found in diabetics using insulin or other pharmacological treatment. Such hypoglycemic episodes vary greatly between persons and from time to time, both in severity and swiftness of onset. For severe cases, prompt medical assistance is essential, as damage (to brain and other tissues) and even death will result from sufficiently low blood glucose levels.
Dextrose Sugar Related Health Problems:
Acne
Addiction to drugs, caffeine & food
Adrenal gland exhaustion
Alcoholism
Allergies
Anxiety
Appendicitis
Arthritis
Asthma
Behavior problems
Binge eating
Bloating
Bone loss
Cancer (cancer cells feed on sugar)
Candidiasis
Cardiovascular disease
Cataracts
Colitis
Constipation
Depression
Dermatitis
Diabetes
Difficulty concentrating
Diverticulitis & diverticulosis
Eczema
Edema
Emotional problems
Endocrine gland dysfunction
Fatigue
Food cravings
Gallstones
Gout
Heart Disease
High blood cholesterol
High estrogen levels
High triglyceride levels
Hormonal problems
Hyperactivity
High blood pressure
Hypoglycemia
Impaired digestion of all foods
Indigestion
Insomnia
Kidney stones
Liver dysfunction
Liver enlargement & fatty liver syndrome
Low HDL cholesterol
Menstrual difficulties
Mental illness
Mood swings
Muscle pain
Nearsightedness
Obesity
Osteoporosis
Overacidity
Parasitic infections
Premature aging & wrinkles
Premenstrual syndrome
Psoriasis
Rheumatism
Shortened life span
Tooth decay
Ulcers
Vaginal yeast infections

Sugar may not be the whole answer to why you are ill, but it could be an important part of the puzzle. Check out the following excellent resources and try a sugar reduction program. Then you'll know how much sugar is influencing your illness by the way you feel.

What to do for your Health
1. Kick the addiction to the high glycemic foods, eat fruits and vegetables and other low glycemic foods.
2. More green tea (use fructose), licorice, and other natural factors for treatment of blood sugar disorders.
3. The fruit juice you buy should never have any processed sugar added, use only fructose.
4. The fruit juice you buy is too often too concentrated. Dilute it buy one third to half for taste.
THE EFFECTS OF STRESS

- impaired cognitive performance
- nervous system
- acne
- suppressed thyroid function
- muscle tension
- blood sugar imbalances
- cardiovascular issues
- skin problems
- endocrine system
- gastrointestinal system
- higher blood pressure
- reproductive system
- decreased bone density
- decrease in muscle tissue
"The sugar in my urine seems to have decreased."

"Hmmm... There's something in this green tea that has the power to reduce the blood sugar level."
Good Sugar and Oil

Eat at least Five servings of fruits and Vegetables a day, use Vegetables as the Center of the Meal. Remember: do not eat foods boiled in oil, get good cold processed vegetable oils and thus good Fatty acids, not trans or cooked or animal oils. Eat only Levulose (fructose fruit sugars) not Dextrose (Cane, Corn, Potatoe, Grape sugar). Wellness is your Reward. Remember to chew your food, Fruits alone, Fluids alone, and Melons alone. Make Vegetable and Fruit juice part of your daily Wellness Healthy Regime.
Fructose, or levulose, is the form of sugar found in fruit and honey. It is a laevorotatory monosaccharide with the same empirical formula as glucose but with a different structure. Although fructose is a hexose (6 carbon atoms), it generally exists as a 5-membered hemiketal ring (a furanose).

All fruit naturally contains a certain amount of fructose (often together with glucose), and it can be extracted and concentrated to make an alternative sugar.
Fructose is often used in food products designed for people with diabetes mellitus or who have problems with hypoglycaemia, because it is metabolised more slowly (GI 32) than cane sugar (dextrose sucrose) and is sweeter, so it has a smaller effect on blood-sugar levels. However, some people can react badly to fructose so it is not an option for those who need to restrict sucrose intake.

1 Structure

The first -OH points the opposite way from the second and third -OH. Be aware, there are mistakes in the formulas of the ring structures! All -CH3’s must be -CH2’s (and instead of H3C- it must read H2C- of course)

1.1 Isomerism

D-Fructose has the same configuration at its penultimate carbon as D-glyceraldehyde. Fructose is more sweet than glucose due to its stereomerism structure

Fructose intolerance is a hereditary condition due to a deficiency of liver enzymes that metabolise fructose. Not to be confused with fructose malabsorption, a deficiency of fructose transporter enzyme in the enterocytes, which leads to bloating and diarrhea.

Fructose malabsorption is a condition in which the fructose carrier in enterocytes is deficient. Symptoms and medical tests are similar as in lactose intolerance. This condition is common in patients with symptoms of irritable bowel syndrome. An appropriate diet can help. A small proportion of patients with both fructose malabsorption and lactose intolerance suffers from coeliac disease.

This is not to be confused with fructose intolerance, an inherited condition in which the liver enzymes that break fructose up are deficient.
**Sugars**

Carbohydrates fulfil important functions in our daily life. Firstly it serves as an energy storage, as fuel and as metabolic intermediate. Secondly it serves in the structure of DNA and RNA. And lastly many sugars are coupled to proteins and fats, and fulfil a role in recognition processes.

The carbohydrates form a large group of molecules. Carbohydrates are also known as saccharin’s or sugars. The name carbohydrate originates from the observation that these substances lose water (hudoor = water) when heat is applied and after that carbon is left. The general formula for carbohydrates is: $C_n(H_2O)_n$.

Carbohydrates are made in large quantities inside plants during the photosynthesis (assimilation).

Hereby carbohydrates are formed from water and carbon dioxide:

$$n \text{H}_2\text{O} + n \text{CO}_2 \rightarrow C_n\text{(H}_2\text{O})_n + n\text{O}_2$$

In this reaction, sun-energy is taken up and is preserved in chemical substances. Carbohydrates are energy storage molecules. This energy can be released by the opposite process: burning (dissimilation). All animal life uses the burning of carbohydrates to obtain energy:
(CH₂O)ₙ + n O₂ → n H₂O + n CO₂ + energy

Carbohydrates are classified based on their molecular size into three groups. The three groups are:

- **Monosaccharides** (simple sugars)
  (among others: **Glucose**, **Fructose**, **Ribose** and **Galactose**)

- **Disaccharides** (molecules composed of two monosaccharides)
  (among others: **Saccharose**, **Maltose** and **Lactose**)

- **Polysaccharides** (macromolecules consisting of long chains composed of saccharides)
  (among others: **Cellulose**, **Starch** and **Glycogen**)

**Monosaccharides**

Monosaccharides are the simplest carbohydrates. They can be divided into aldos and ketoses. The formula for monosaccharides is (CH₂O)ₙ. The smallest monosaccharides are, with three carbon atoms (n = 3), glyceraldehyde and dihydroxyacetone. Glyceraldehyde is called an aldose because it contains one aldehyde group. Dihydroxyacetone is called a ketose because it has one keto group.

Glyceraldehyde has an asymmetrical carbon atom, because of that, two different forms of the molecule are possible. These two forms are indicated by D- and L-Glyceraldehyde. The letter D and L refer to the asymmetrical carbon atom which is located the farthest away from the aldehyde or keto group (here one after the lowest atom). There are for aldose with three carbon atoms (trioses) two different forms possible. For aldose with four carbon atoms (tetroses), there are four different forms possible, because there are two asymmetrical carbon atoms. For aldose with five C-atoms (pentoses) there are eight different and with six C-atoms (hexoses) there are sixteen different forms possible.

Below the different aldoses until six carbon atoms are represented. The aldehyde group is represented in green. These sugars have the D configuration and are indicated in red. For each of the aldose there is also an L-form.
In the group of the ketoses also much different forms are distinguishable. Ketoses also have D and L form, except dihydroxyacetone because it has no asymmetrical carbon atom. There are less different ketoses than aldoses because they have an asymmetrical carbon atom less. Below the different ketoses until six carbon atoms are represented. They are called ketoses because they contain a keto group (represented in green). The group causing the D-configuration of the ketose is represented in red. For each D-ketose there is also an L is form.
The most important and most known monosaccharide are: glucose, fructose, galactose and ribose.

Glucose and fructose in a solution are not prevent in the closed extended form proposed until now, but a ring like form.

In glucose, the aldehyde group at the C-1 atom reacts with the hydroxyl group at C-5 to form a ring. This ring form is also called a pyranose because it resembles pyran.
By forming this ring an asymmetrical carbon atom on carbon atom 1 is formed. Because of this, two different forms of the sugar are possible. These two forms are called alpha or beta-D-Glucopyranose.

Ketose also form a ring structure. The keto group at C-2 reacts with the hydroxyl group at C-5 and form a ring structure. This five carbon atom ring is called a furanose because it resembles furan.

Glucose

Glucose is also called dextrose. Glucose is a sugar that consists of six carbon atoms. These carbon atoms lie in a ring. This gives an asymmetrical molecule of five carbon atoms in a ring and 1 carbon atom outside of the ring.
Glucose is generally present in living organisms. The human blood contains approximately 0.8 g/l (5 mmol/l) of glucose. In case of an illness, the glucose level may have changed. Glucose is also a many measured mark in hospital laboratories.

Glucose is taken up in the small intestine and is transported to the liver via the hepatic portal vein. The liver regulates the glucose concentrations in the blood. If there is too much glucose in the blood, glycogen is formed. And when there is too little glucose in the blood, this glycogen is broken down again into glucose. This is all regulated in the glycogen metabolism.

Glucose is used as a fuel, glucose is energy. The use of glucose as energy happens in the metabolic processes: Glycolysis and Citric acid cycle.

Fructose

Fructose, is found in high concentrations in fruits and is a constituent of honey. Fructose tastes less sweet than glucose. Fructose is a sugar that exists of six carbon atoms. These carbon atoms lie in one ring. This gives a symmetric molecule of four carbon atoms in one ring and two carbon atoms at both sides of the ring.

Fructose is not taken up as well as glucose by the small intestine.

Galactose

Galactose is also a sugar with six carbon atoms with a somewhat different structure as glucose.
Galactose is taken up better by the small intestine than fructose. Galactose arises in the small intestine from lactose (milk sugar) from milk. Lactose is a disaccharide that consists of glucose and galactose. This lactose is broken down by lactase, produced by the intestine glands.

Ribose

Ribose is a sugar that exists of five carbon atoms. It resembles fructose, only in ribose a side chain has been taken off.

Ribose is one of the most important building blocks of large molecules. Ribose is part of the molecules: AMP, ADP, ATP, cyclical AMP and RNA. Also in DNA ribose is built in, but in the case DNA a variant called desoxiribose. Ribose can be produced by the body in the metabolic process the pentose cycle, in the form of ribose-5-phosphate.

Disaccharides

When two cyclic monosaccharides (acetal bonding) are coupled by means of a glucoside bonding a disaccharides arises. A glycoside bonding arises together with a split off of water. Disaccharides are commonly present in nature and form important components of foods. Disaccharides are also important in the formation of polysaccharides and monosaccharides. The most important disaccharides are: Saccharose, Maltose and Lactose.
Saccharose

Saccharose is also known as: sugar, table sugar, sucrose. The organic chemical name is Alpha-D-Glucopyranosyl-(1->2)-Beta-D-fructofuranoside. This disaccharide is composed of the monosaccharides glucose and fructose.

During the digestion, saccharose is broken down by the enzyme invertase in glucose and fructose. Invertase is also called sucrase. This enzyme is produced in the small intestine where the breakdown of sucrose occurs.

The known sugar from the daily life consists of saccharose, just as powdered sugar and sugar syrup.

Maltose

Maltose is also called malt sugar. This disaccharide is composed of two of the monosaccharides glucose. These glucose units are connected with an alpha 1,4 bond. Maltose can be broken down in our digestive system. The enzyme maltase can break down maltose in individual glucose units. The enzyme maltase is produced in the small intestine. Maltase hydrolysis the alpha-(1-4)-bond in maltose in which glucose is released. Glucose is absorbed in the small intestine.

The word *alpha*, in the name of the alpha 1,4 bond between the two glucose units, indicate that the
two units are in a straight area. The numbers 1,4 indicate that the bond is present between the carbon atoms 1 and 4.

**Lactose**

Lactose is also known as milk sugar and is present in milk. The organic chemical name is Beta-D-Galactopyranosyl-(1->4)-Alpha-D-Glucopyranose. Lactose is composed of the monosaccharides galactose and glucose. The two molecules are connected by a Beta-1,4-bond.

![Diagram of lactose structure](image)

The word *Beta*, in the name of the bond between the two monosaccharides units, indicates that the two units are not in a straight area, they are slant on each other. The numbers 1,4 mean that the bonds is present between the carbon atom 1 of galactose and carbon atom 4 of glucose.

**Lactose intolerance**

Lactose is broken down in the digestion to galactose and glucose by the enzyme lactase. Most children can break down lactose in their digestion. In contrast to children, there is a large group of adults in the world that can not produce the enzyme lactase. These people are intolerant to milk. After drinking milk, lactose accumulates in the lumen of the intestine because there is no mechanism to take up this disaccharide. The symptoms of lactose intolerance are nausea, cramp, pain and diarrhoea.

Lactose intolerance is a genetic variation that mostly presents itself in adolescent or in adult life. Lactose intolerance is prevalent in 3% of Danish people, and in 97 % of Thai people. There is lactase treated milk available for lactose intolerant people. The ability of people to break down lactose also in maturity appears to have been developed since people started to domesticate cow cattle. This was some thousand years ago.

**Polysaccharides**
Polymers are biomolecules composed of units in which we can recognize the monosaccharides. Some polysaccharides can be hydrolysed by enzymes in our digestion. In this process polysaccharides are split up in monosaccharides. The most important polysaccharides are: **Cellulose**, **Starch** and **Glycogen**.

### Cellulose

Cellulose is an important "building material" in plants. Cellulose is harvested from vegetable material such as straw and cotton plants. Natural textile fibre such as linen (flax), cotton and viscose (artificial silk) consist of cellulose. Just as paper, cardboard, cotton wadding and cellophane. Cellulose can not be broken down in our digestive system. Humans do not have an enzyme that is able to break down the beta bonds in cellulose. Cellulose and other indigestible compounds form the **dietary fiber**, which are important in our digestive system.

### Starch

Starch is an energy storage molecule for plants. There are two forms of starch. The not subdivided form is called Amylose. In Amylose the glucose units are coupled by Alpha-1,4-bonding. The second form is Amylopectine. In this form, there are branchings in the form of alpha-1,6-bonds that occur once every thirty units. This form resembles glycogen, but with less alpha-1,6 branchings. Starch can be broken down in our digestive system. Starch is broken down in individual glucose units by the action of the enzyme amylase. Amylase is present in our saliva and is produced by the
pancreas. Amylase hydrolysis the alpha-(1,4)-bonds. Glucose is absorbed in the small intestine.

Glycogen serves as an energy storage in humans. It consists of glucose units that are coupled by Alpha-1,4-bonds, with branchings as alpha-1,6-bonds. The 1,6 bonds occur every ten units.

For an extensive discussion about glycogen and the glycogen metabolism, see the glycogen metabolism.
We call this handedness CHIRALITY, from the Greek CHIRO meaning hand.

**Chirality (chemistry)**

[Diagram of chiral molecule]

Two enantiomers of a generic amino acid

(S)-Alanine (left) and (R)-alanine (right) in zwitterionic form at neutral pH

A **chiral molecule** is a type of molecule that lacks an internal plane of symmetry and has a non-superimposable mirror image. The feature that is most often the cause of chirality in molecules is the presence of an asymmetric carbon atom.¹²

The term **chiral** (pronounced /ˈkaɪrəl/) in general is used to describe an object that is non-superposable on its mirror image. **Achiral** (not chiral) objects are objects that are identical to their mirror image. Human hands are perhaps the most universally recognized example of chirality: The left hand is a non-superposable mirror image of the right hand; no matter how the two hands are oriented, it is impossible for all the major features of both hands to coincide. This difference in symmetry becomes obvious if someone attempts to shake the right hand of a person using his left hand, or if a left-handed glove is placed on a right hand. The term chirality is derived from the Greek word for hand, χείρ (cheir). It is a mathematical approach to the concept of "handedness".

In chemistry, chirality usually refers to molecules. Two mirror images of a chiral molecule are called enantiomers or optical isomers. Pairs of enantiomers are often designated as "right-" and "left-handed."

Molecular chirality is of interest because of its application to stereochemistry in inorganic chemistry, organic chemistry, physical chemistry, biochemistry, and supramolecular...
The term *optical activity* is derived from the interaction of chiral materials with polarized light. A solution of the (−)-form of an optical isomer rotates the plane of polarization of a beam of plane polarized light in a counterclockwise direction, vice-versa for the (+) optical isomer. The property was first observed by Jean-Baptiste Biot in 1815, and gained considerable importance in the sugar industry, analytical chemistry, and pharmaceuticals. Louis Pasteur deduced in 1848 that this phenomenon has a molecular basis. Artificial composite materials displaying the analog of optical activity but in the microwave region were introduced by J.C. Bose in 1898, and gained considerable attention from the mid-1980s. The term *chirality* itself was coined by Lord Kelvin in 1873.

The word "racemic" is derived from the Latin word "racemus" for "bunch of grapes"; the term having its origins in the work of Louis Pasteur who isolated racemic tartaric acid from wine.

**Symmetry**

The symmetry of a molecule (or any other object) determines whether it is chiral. A molecule is achiral (not chiral) when an improper rotation, that is a combination of a rotation and a reflection in a plane, perpendicular to the axis of rotation, results in the same molecule (see chirality (mathematics)). A simplified, if incomplete, rule is that a chiral molecule lacks a plane of symmetry. For tetrahedral molecules, the molecule is chiral if all four substituents are different. A chiral molecule is not necessarily asymmetric (devoid of any symmetry element), as it can have, for example, rotational symmetry.

**Naming conventions**

**By configuration: R- and S-**

For chemists, the $R/S$ system is the most important nomenclature system for denoting enantiomers, which does not involve a reference molecule such as glyceraldehyde. It labels each chiral center $R$ or $S$ according to a system by which its substituents are each assigned a priority, according to the Cahn Ingold Prelog priority rules (CIP), based on atomic number. If the center is oriented so that the lowest-priority of the four is pointed away from a viewer, the viewer will then see two possibilities: If the priority of the remaining three substituents decreases in clockwise direction, it is labeled $R$ (for Rectus), if it decreases in counterclockwise direction, it is $S$ (for Sinister).

This system labels each chiral center in a molecule (and also has an extension to chiral molecules not involving chiral centers). Thus, it has greater generality than the D/L system,
and can label, for example, an \((R,R)\) isomer versus an \((R,S)\) — diastereomers.

The \(R/S\) system has no fixed relation to the \((+)/(−)\) system. An \(R\) isomer can be either dextrorotatory or levorotatory, depending on its exact substituents.

The \(R/S\) system also has no fixed relation to the \(D/L\) system. For example, the side-chain one of serine contains a hydroxyl group, -OH. If a thiol group, -SH, were swapped in for it, the \(D/L\) labeling would, by its definition, not be affected by the substitution. But this substitution would invert the molecule's \(R/S\) labeling, because the CIP priority of CH\(_2\)OH is lower than that for CO\(_2\)H but the CIP priority of CH\(_2\)SH is higher than that for CO\(_2\)H.

For this reason, the \(D/L\) system remains in common use in certain areas of biochemistry, such as amino acid and carbohydrate chemistry, because it is convenient to have the same chiral label for all of the commonly occurring structures of a given type of structure in higher organisms. In the \(D/L\) system, they are nearly all consistent - naturally occurring amino acids are nearly all \(L\), while naturally occurring carbohydrates are nearly all \(D\). In the \(R/S\) system, they are mostly \(S\), but there are some common exceptions.

**By optical activity: \((+)- and \((−)-\)**

An enantiomer can be named by the direction in which it rotates the plane of polarized light. If it rotates the light clockwise (as seen by a viewer towards whom the light is traveling), that enantiomer is labeled \((+)-\). Its mirror-image is labeled \((−)-\). The \((+)-\) and \((−)-\) isomers have also been termed \(d\)- and \(l\)-, respectively (for dextrorotatory and levorotatory). Naming with \(d\)- and \(l\)- is easy to confuse with \(D\)- and \(L\)- labeling.

**By configuration: \(D\)- and \(L\)-**

An optical isomer can be named by the spatial configuration of its atoms. The \(D/L\) system does this by relating the molecule to glyceraldehyde. Glyceraldehyde is chiral itself, and its two isomers are labeled \(D\) and \(L\) (typically typeset in SMALL CAPS in published work). Certain chemical manipulations can be performed on glyceraldehyde without affecting its configuration, and its historical use for this purpose (possibly combined with its convenience as one of the smallest commonly used chiral molecules) has resulted in its use for nomenclature. In this system, compounds are named by analogy to glyceraldehyde, which, in general, produces unambiguous designations, but is easiest to see in the small biomolecules similar to glyceraldehyde. One example is the amino acid alanine, which has two optical isomers, and they are labeled according to which isomer of glyceraldehyde they come from. On the other hand, glycine, the amino acid derived from glyceraldehyde, has no optical activity, as it is not chiral (achiral). Alanine, however, is chiral.

The \(D/L\) labeling is unrelated to \((+)/(−); it does not indicate which enantiomer is dextrorotatory and which is levorotatory. Rather, it says that the compound's stereochemistry is related to that of the dextrorotatory or levorotatory enantiomer of glyceraldehyde—the dextrorotatory isomer of glyceraldehyde is, in fact, the \(D\)- isomer. Nine of the nineteen \(L\)-amino acids commonly found in proteins are dextrorotatory (at a wavelength of 589 nm), and
D-fructose is also referred to as levulose because it is levorotatory.

A rule of thumb for determining the D/L isomeric form of an amino acid is the "CORN" rule. The groups:

\[ \text{COOH, R, NH}_2 \text{ and H (where R is a variant carbon chain)} \]

are arranged around the chiral center carbon atom. Sighting with the hydrogen atom away from the viewer, if these groups are arranged clockwise around the carbon atom, then it is the D-form. If counter-clockwise, it is the L-form.

**Nomenclature**

- Any non-racemic chiral substance is called **scalemic**.\[8\]
- A chiral substance is **enantiopure** or **homochiral** when only one of two possible enantiomers is present.
- A chiral substance is **enantioenriched** or **heterochiral** when an excess of one enantiomer is present but not to the exclusion of the other.
- **Enantiomeric excess** or **ee** is a measure for how much of one enantiomer is present compared to the other. For example, in a sample with 40% ee in R, the remaining 60% is racemic with 30% of R and 30% of S, so that the total amount of R is 70%.

**Stereogenic centers**

In general, chiral molecules have **point chirality** at a single **stereogenic** atom, usually carbon, which has four different substituents. The two enantiomers of such compounds are said to have different **absolute configurations** at this center. This center is thus stereogenic (i.e., a grouping within a molecular entity that may be considered a focus of stereoisomerism).

Normally when an atom has four different substituents, it is chiral. However in rare cases, two of the ligands differ from each other by being mirror images of each other. When this happens, the mirror image of the molecule is identical to the original, and the molecule is achiral. This is called pseudochirality.

A molecule can have multiple chiral centers without being chiral overall if there is a symmetry between the two (or more) chiral centers themselves. Such a molecule is called a **meso compound**.

It is also possible for a molecule to be chiral without having actual point chirality. Common examples include 1,1'-bi-2-naphthol (BINOL) and 1,3-dichloro-allene, which have **axial chirality**, (\(E\))-**cyclooctene**, which has **planar chirality**, and certain **calixarenes** and **fullerenes**, which have **inherent chirality**.

It is important to keep in mind that molecules have considerable flexibility and thus, depending on the medium, may adopt a variety of different conformations. These various conformations are themselves almost always chiral. When assessing chirality, a time-
averaged structure is considered and for routine compounds, one should refer to the most symmetric possible conformation.

When the optical rotation for an enantiomer is too low for practical measurement, it is said to exhibit cryptochirality.

Even isotopic differences must be considered when examining chirality. Replacing one of the two $^1H$ atoms at the CH$_2$ position of benzyl alcohol with a deuterium ($^2H$) makes that carbon a stereocenter. The resulting benzyl-$\alpha$-$d$ alcohol exists as two distinct enantiomers, which can be assigned by the usual stereochemical naming conventions. The $S$ enantiomer has $[\alpha]_D = +0.715^\circ$.\[9\]

### Properties of enantiomers

Normally, the two enantiomers of a molecule behave identically to each other. For example, they will migrate with identical $R_f$ in thin layer chromatography and have identical retention time in HPLC. Their NMR and IR spectra are identical. However, enantiomers behave differently in the presence of other chiral molecules or objects. For example, enantiomers do not migrate identically on chiral chromatographic media, such as quartz or standard media that have been chirally modified. The NMR spectra of enantiomers are affected differently by single-enantiomer chiral additives such as Eufod.

Chiral compounds rotate plane polarized light. Each enantiomer will rotate the light in a different sense, clockwise or counterclockwise. Molecules that do this are said to be optically active.

Characteristically, different enantiomers of chiral compounds often taste and smell differently and have different effects as drugs – see below. These effects reflect the chirality inherent in biological systems.

One chiral 'object' that interacts differently with the two enantiomers of a chiral compound is circularly polarised light: An enantiomer will absorb left- and right-circularly polarised light to differing degrees. This is the basis of circular dichroism (CD) spectroscopy. Usually the difference in absorptivity is relatively small (parts per thousand). CD spectroscopy is a powerful analytical technique for investigating the secondary structure of proteins and for determining the absolute configurations of chiral compounds, in particular, transition metal complexes. CD spectroscopy is replacing polarimetry as a method for characterising chiral compounds, although the latter is still popular with sugar chemists.

### In biology

Many biologically active molecules are chiral, including the naturally occurring amino acids (the building blocks of proteins), and sugars. In biological systems, most of these compounds are of the same chirality: most amino acids are L and sugars are D. Typical naturally occurring proteins, made of L amino acids, are known as left-handed proteins, whereas D
amino acids produce right-handed proteins.

The origin of this homochirality in biology is the subject of much debate. Most scientists believe that Earth life's "choice" of chirality was purely random, and that if carbon-based life forms exist elsewhere in the universe, their chemistry could theoretically have opposite chirality. However, there is some suggestion that early amino acids could have formed in comet dust. In this case, circularly polarised radiation (which makes up 17% of stellar radiation) could have caused the selective destruction of one chirality of amino acids, leading to a selection bias which ultimately resulted in all life on Earth being homochiral.

Enzymes, which are chiral, often distinguish between the two enantiomers of a chiral substrate. Imagine an enzyme as having a glove-like cavity that binds a substrate. If this glove is right-handed, then one enantiomer will fit inside and be bound, whereas the other enantiomer will have a poor fit and is unlikely to bind.

D-form amino acids tend to taste sweet, this enhances the sweet effect of dextrose. Whereas L-forms are usually tasteless, or in the case of fructose less sweet in flavor but more dynamic in variation. Spearmint leaves and caraway seeds, respectively, contain L-carvone and D-carvone - enantiomers of carvone. These smell different to most people because our olfactory receptors also contain chiral molecules that behave differently in the presence of different enantiomers.

Chirality is important in context of ordered phases as well, for example the addition of a small amount of an optically active molecule to a nematic phase (a phase that has long range orientational order of molecules) transforms that phase to a chiral nematic phase (or cholesteric phase). Chirality in context of such phases in polymeric fluids has also been studied in this context.

In inorganic chemistry

Main article: Complex Chemistry

Many coordination compounds are chiral; for example, the well-known tris(bipyridine)ruthenium(II) complex in which the three bipyridine ligands adopt a chiral propeller-like arrangement.
In this case, the Ru atom may be regarded as a stereogenic center, with the complex having point chirality. The two enantiomers of complexes such as \([\text{Ru}(2,2'-\text{bipyridine})_3]^{2+}\) may be designated as \(\Lambda\) (left-handed twist of the propeller described by the ligands) and \(\Delta\) (right-handed twist). Hexol is a chiral cobalt complex that was first investigated by Alfred Werner. Resolved hexol is significant as being the first compound devoid of carbon to display optical activity.

**Chirality of amines**

Tertiary amines (see image) are chiral in a way similar to carbon compounds: The nitrogen atom bears four distinct substituents counting the lone pair. However, the energy barrier for the inversion of the stereocenter is, in general, about 30 kJ/mol, which means that the two stereoisomers are rapidly interconverted at room temperature. As a result, amines such as \(\text{NHRR'})\) cannot be resolved optically and \(\text{NRR'R''}\) can only be resolved when the \(\text{R}, \text{R}',\) and \(\text{R''}\) groups are constrained in cyclic structures as in Tröger's base.

- **Stereochemistry** for overview of stereochemistry in general
- **Axial chirality**
- **Supramolecular chirality**
- **Inherent chirality**
- **Chirality (physics)**
- **Chirality (mathematics)**
- **Pfeiffer Effect**
- **Chemical chirality in popular fiction**
In carbon based compounds, chirality is present when a carbon atom has four different chemical groups attached to it. There are then two possible OPTICAL ISOMERS. The molecular formula is identical, but the orientation of two chemical groups is different, as they are mirror images of each other. The two isomers can be distinguished by shining a beam of polarised light on the compounds and measuring rotation with a polarimeter. One optical isomer will rotate the plane of polarised light to the right and the other optical isomer will rotate it to the left. The right handed molecule is called RECTUS or DEXTRO and the left handed molecule SINISTER or LEVO.

Some common examples of optical isomers are sugars and amino acids. All naturally occurring sugars are right handed (for example dextrose which is D-glucose) and all naturally occurring amino acids are left handed (for example L-phenylalanine). Why life has evolved to favour just one isomer of each of these is a mystery, but the enzymes responsible for metabolising these nutrients can only recognise the naturally occurring form of each.

Other examples of optical isomers which we can distinguish between are found in the plant hydrocarbons carvone and limonene. S-carvone smells like caraway and is the major component of caraway oil. R-carvone however smells like spearmint and is the principle constituent of spearmint oil. Some oils like gingergrass oil contain a mixture of both optical isomers. D-limonene is found in the rind of citrus fruits and is responsible for the orange/lemon smell. L-limonene however has a piney, turpentine like smell. Our smell receptors are obviously able to detect a difference between the two optical isomers.

Spirals or helices in nature can also show chirality. The DNA double helix in the nucleus of a cell is always a right handed helix. This means it turns in a clockwise direction when travelling away from you. However the collagen triple helix in connective tissue is always a left handed helix. This means it turns in an anticlockwise direction when travelling away from you. You can check whether any helix has a right or left handed turn by using these definitions - try it yourself on spiral staircases, corkscrews, fusilli pasta and even knitting yarn. It doesn't matter which end of the helix you start from, the handedness is true from either end.

Climbing plants are also good examples of helices in nature. The shoots of some plants such as honeysuckle twist to the right (clockwise) whereas the shoots of others such as bindweed twist to the left (anticlockwise). The doomed marriage of these two plants was the subject of the classic song "Misalliance" by Flanders and Swann. External conditions such as humidity, light, heat or the earth's hemisphere cannot alter this handedness of climbing as it is genetically determined. In fact the Latin name of the ubiquitous climbing plant Common Ivy is Hedera helix, which itself means twisting.

The soft curly tendrils of clinging plants such as grape vines and beans however, can have their helices reversed when the tendril touches a support. This so-called "tendril perversion" fascinated Charles Darwin and he wrote about it at length in his book "The Movements and Habits of Climbing Plants". When the tendril starts to curl and
tighten up, since neither the stem nor the support can rotate, the total twist in the tendril cannot change. Therefore, as the tendril curls on itself, the coils of the spiral are reversed at some point and the two opposite spirals are separated by a small straight segment. This phenomenon can be likened in the modern sense to a coiled telephone cable, which is first completed extended, untwisted and then slowly released. A spiral inversion will appear, usually with annoying snarls.

There are many examples of handedness in synthetic molecules as well all right handed- try looking on the labels of toiletries, household chemicals and medicines when you go shopping. And the next time anyone asks "Do you take sugar?" you can reply "Yes, but only if it's left handed !"

**Literature**


Negative refraction. (a) shows an empty glass, (b) a glass filled with an ordinary medium with positive refractive index, such as water; the straw inside the glass is refracted. (c) shows what would happen if the water is replaced by a negatively refracting medium. From the Nanophotonics group at the Karlsruhe Institute of Technology.

Left-handed (or negatively-refracting) materials turn out to transform space for
electromagnetic fields and their vacuum fluctuations \cite{2,10}.

References on Quantum Handedness

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See e.g. E. Buks and M. L. Roukes, Quantum physics: Casimir force changes sign, *Nature* **419**, 119

**References**

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11. ^[1], New Scientist, 2005