

Carbohydrates—On Everyone’s Mind

Carbohydrates are one of the major energy ingredients in your diet. They come mostly from plant sources that store the solar energy in small building units called saccharides (sweetener). Different saccharides forms are as follows:

Simple Carbohydrates

Monosaccharides

Glucose

Fructose

Galactose

Mannose

Glucose

Examples:

Fruit, honey, corn syrup

Fruit, honey, juices, corn

Fruit, honey

Pineapple, carrots, and

Fruit, honey, corn syrup

Disaccharides

Sucrose

Lactose

Maltose

Examples:

Cane sugar, maple syrup

Milk and milk products

Malt products and some

Carbohydrate Derivatives

Ethyl alcohol

Lactic acid

Malic acid

Examples:

Fermented grains

Milk and milk products

Fruits

Monosaccharides contain one carbohydrate molecule such as glucose, fructose, or galactose. Glucose comes from sugar, fructose from fruits, and galactose from milk. Disaccharides, such as Maltose, Sucrose, and Lactose, each contain two carbohydrate molecules. Maltose, which comes from malt syrup, contains two glucose units. Sucrose that comes from sugar has glucose and fructose. Lactose, found in milk, has glucose and galactose. Oligosaccharides have five to

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six molecules of glucose or other monosaccharides. Polysaccharides contain many molecules of monosaccharides in strings or branched long-chains. Starches are polysaccharides having many molecules of monosaccharides in strings or branched long chains (like pearl beads in a necklace). Starches are found in cereals, pulses, and potatoes.

Fermentation of carbohydrate produces carbohydrate derivative such as ethyl alcohol. Each gram of ethyl alcohol provides seven kilocalories of energy, unlike most other carbohydrates that produce four kilocalories.

Complex Carbohydrates

Complex carbohydrates are polysaccharides that consist of multiple monosaccharide units connected by more than one glycosidic link.

1. Digestible Complex Carbohydrates:

Polysaccharides	Amylose
Starch and dextrin	Grains, legumes and vegetables
Glycogen	Meats

2. Partially Digested Complex Carbohydrates:

Inulin	Jerusalem Artichokes, onions, garlic
Mannoses	Legumes
Raffinose	Sugar beets, kidney beans, lentils, navy beans
Starchyose	Dried beans
Penthouses	Fruits and gums

3. Indigestible Complex Carbohydrates (Dietary Fiber):

Cellulose	Vegetables and seeds
Hemicellulose	Vegetables and seeds
Pectin	Citrus fruits

Source: Mahan, L.K. and Escott-Stump, S. Krause's Food, Nutrition & Diet Therapy, 10th ed., 2000.

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Starches are complex carbohydrates that have alpha glycosidic linkages, which are readily digested by intestinal amylases. On the other hand, dietary fibers are also complex carbohydrates that have beta linkages, which are resistant to digestive enzymes.

Refined carbohydrates result from the removal of fiber from complex carbohydrates. Breaking carbohydrates into tiny particles also increases their absorption rate, thus raising their Glycemic Index.

Fibers are large carbohydrate molecules that are resistant to the human digestive process. They can be soluble or insoluble. The soluble fibers do not directly affect the digestion. They undergo bacterial fermentation in the large intestine, producing short-chain fatty acids that are absorbed in the colon. Fermentable fiber provides roughly 2 kilocalories for each gram. The insoluble fibers absorb water and slow food digestion. Indigestible or insoluble fiber facilitates the transportation of nutrients and waste products across the intestinal tract. It also lowers intraluminal pressure and promotes bowel regularity.

Nearly all carbohydrates come from plant sources. Most vegetable sources contain some carbohydrates. Therefore, it is important to count the invisible carbohydrate calories in foods such as vegetables, beans, and fruits when adding up your daily calorie intake. Carbohydrates provide your daily energy needs. Excess carbohydrates that are not used immediately are converted into glycogen and stored in the liver and muscle tissues. Glycogen serves as the reserve for immediate energy needs during exercise or starvation. Your body stores less than 200g of glycogen. Any surplus carbohydrates not stored as glycogen will be eventually converted into fat and deposited in your fatty tissue.

Carbohydrates promote insulin surges leading to fat deposition and weight gain. This weight gain leads to insulin resistance and stimulates more insulin production, leading to hyperinsulinism. Hyperinsulinism is one of the major problems in obese and diabetic people.

Although your body can burn carbohydrates, proteins, fats, and alcohol for energy, it cannot store alcohol. Therefore, it has to utilize all the energy it receives from alcohol. Normally, your body uses carbohydrates, proteins, and fats, in that order, for its energy sources. Immediately following a meal, your body has an excess carbohydrate energy source. However, between meals, when carbohydrate sources are low, your body burns fat for a constant energy source. Hence, a well-balanced carbohydrate intake providing just enough energy on a

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minute-to-minute basis, but not too much so that it turns into fat, is a critical concept in weight control. Let your body use its own fat for a continual energy source. If you plan to loose weight, do so by lowering your carbohydrate intake to less than what your body needs on a minute-to-minute basis. In contrast to Atkins' diet that recommends an unlimited fat intake, *I recommend that you let your body use its own abundant fat source you are trying to get rid of.* Your body knows how much fat to mobilize in a methodical fashion, as apposed to your mouth that does not know when to stop, especially when indulged in a heaven of delicious deserts and mouthwatering pies. You get the picture!!

In order to maintain a heart-healthy lifestyle, you need to lower your carbohydrate and fat intake. You also have to pay special attention to fiber, salt, cholesterol, Omega-3 fatty acids, and supplements that can significantly lower your cholesterol level without prescription medicines.

Carbohydrates in the body

The body stores carbohydrates in four major forms. The most important form, namely glucose, constantly circulates in the blood to provide a minute-to-minute energy source. The second form, glycogen, provides energy over an extended time frame. The next form (fiber) constitutes the structural foundation of human tissues and cell walls. Final form, a glycoprotein, is a combination of complex carbohydrates and proteins. These glycoproteins play an important role in carrying chemicals, hormones, and enzymes in the blood.

Polysaccharides may have hundreds of thousands of monosaccharide molecules. Some polysaccharides such as cellulose are lineal chains, whereas others such as glycogen are branched chains.

Carbohydrate Quality: Glycemic Index

You should carefully watch the quality and the quantity of the carbohydrates that you consume. First, let's talk about carbohydrate quality. The Glycemic Index (GI), which determines the carbohydrate quality, is based on the rate at which a given carbohydrate raises your blood sugar level compared to a known quantity of pure glucose. Following a carbohydrate intake, if your blood sugar rises as quickly as

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it would with pure glucose consumption as a GI of 100%. As you can see, carbohydrates with high GI raise your blood sugar levels quickly and thus increase the insulin demand.

Therefore, low GI foods have several benefits. They not only raise your blood sugar gradually, compared to high GI foods, but they also do not cause a sudden insulin surge. Low GI foods provide carbohydrate energy over a longer period than high GI foods, while also reducing hunger. In the long run, they lessen the diabetic risk.

So, how do you select low glycemic index carbohydrates?

The Glycemic Index tables, at the end of this chapter, list foods that have high and low GI.

You may have to adjust your daily eating habits significantly in order to include carbohydrates with a GI of 50 or lower in your dietary routine. It means drastically reducing your intake of high GI foods, such as white rice, purified flour, or white bread. It may even mean a major change in your dietary culture, if not your religion! Using low GI foods will also promote overall health, since you will be eating better quality carbohydrates that your body honestly deserves.

I recommend replacing your high GI carbohydrate servings with lower GI fruits and vegetables that also provide fiber, minerals, nutrients, vitamins, enzymes, flavor, and freshness without the preservatives!

Diabetics and endurance athletes have used low GI foods for years. It grabbed the public attention when two diet books *The Zone* and *Sugar Busters* with a high protein diet plans came into the market. The authors of these books claimed that by choosing foods with low GI ratings it was possible to achieve a rapid and steady weight loss. However, their idea, as well as their diets, remains controversial.

Please note that the GI of individual foods will change when combined with other foods. Thus, it is best to select foods that have a GI of less than 50 so that the overall GI will probably drop further when combined with other food choices.

A well-balanced diet must have the right combination, quantity, and quality of food products. It must also incorporate high fiber, low salt, and low cholesterol foods to provide the best foundation for a heart-healthy lifestyle. The daily total calorie and the quality of the calorie you consume are equally important.

Glycemic Index (GI) Ratings Drawbacks

GI ratings are for individual foods and not for food combinations (meals or snacks). The American Diabetes Association has stated that the GI ratings of many foods are less accurate when the foods are eaten together at mealtimes. For example, jelly or jam has a high GI rating; but when eaten together with whole wheat bread, your body digests the jelly and bread combination more slowly, thus reducing the ultimate GI rating.

Fatty foods, such as chocolates, sausages, and peanuts, when mixed with carbohydrates, slow digestion. That leads to an ultimate lower carbohydrate glycemic index. Yet, there is a clear, statistical correlation between the excess fat (low GI) consumption and obesity-related illnesses such as heart disease, diabetes, or strokes. Therefore, following a diet plan based solely on a low Glycemic Index may prove to be unsafe. A more logical approach would be to combine low GI carbohydrates with vegetables, fruits, or fiber-rich food products. This combination by further lowering your ultimate GI and reducing your fat intake would improve your over all health.

Another way to decrease the carbohydrate absorption rate in the stomach is to increase the stomach acidity by adding lemon juice, vinegar, or acidic fruits to your foods or salads. Increased acidity, by slowing the food-emptying rate from the stomach, reduces the carbohydrate absorption rate.

Carbohydrate Metabolism

Did you know that your blood contains less than 20 grams of carbohydrates, less than the amount of the carbohydrates found in a soft drink or a doughnut? Now you wonder, what happens to the other six soft drinks that you consume daily? Well! It just adds to your belt or hip line. Excess carbohydrates you consume are stored as glycogen (up to 450 to 500 grams) in the liver and muscle. Glycogen can provide energy for approximately 16 hours. Contrast that to the unlimited amount of energy your body can store as fat. Excess proteins are broken down into amino acids, which are later utilized to produce glucose.

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In extreme circumstances, human beings can survive for as long as 60 to 90 days without any food. Some obese people have been known to survive over a year without food. However, I do not recommend that you starve yourself to fit your peers' image of yours. In fact, trying to impress someone can be a futile contest. What happens once you impress that person? What will happen to your driving force? You should cultivate a fundamental behavioral change and adopt a heart-healthy lifestyle as your trademark.

When the blood glucose level drops, the body releases glucose from the glycogen stored in the liver or muscles to provide short-term energy. However, if the glycogen stores are low, your body generates glucose from non-carbohydrate sources namely amino acids or fatty acids by a process known as *gluconeogenesis*. The two hormones *insulin* and *glucagon* that are produced by your pancreas regulate your blood sugar level. As your blood sugar (glucose) level rises, your pancreas stimulates *insulin* production that transfers glucose into the liver, muscle, and or fatty tissue. As the blood sugar level falls, pancreas stimulates *glucagon* production promoting new glucose formation.

Insulin increases glucose transfer into the liver or muscles, augments the cellular uptake of amino acids, and promotes protein synthesis. However, it also promotes long-chain fatty acids synthesis and storage, by a process known as *lipogenesis*. Each time you load your body with carbohydrates you are promoting fat buildup. Hence, the key to prevent fat buildup is to reduce your carbohydrate intake to match your daily energy requirement. Excess insulin causes arterial damage. In the long run, frequent insulin surges lead to *insulin resistance and hyperinsulism*, due to your body's decreased ability to respond to insulin peaks. Insulin resistance is commonly seen in morbidly obese and diabetic people.

Most people argue that ketones are bad. Ketones are neither bad nor good as long as they are self-contained. However, serious ketosis occurring during extreme degrees of starvation can be harmful. On the other hand, we must understand the basic biochemical mechanism by which the body mobilizes fat from our enormous fat source, if we are interested in losing weight. When fat is broken down, ketones are produced no matter whether you are on a very low carbohydrate diet, starvation, or high protein diet. Your body mobilizes fat by first

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converting it into triglycerides and then into ketones. The problem of uncontrolled ketone levels occurs when you restrict your carbohydrate intake and at the same time increase your fat intake.

Adrenalin promotes increase in your blood glucose level in responses to stress by promoting the glycogen breakdown in the liver and muscle tissues. When the blood glucose level falls below a certain critical level (60 mg%), the body stimulates adrenaline and glucagon release to maintain the blood glucose level in a narrow range between 80-110 mg%. If the blood glucose level continues to drop, a person can get confused or lose consciousness. Significantly low blood sugar level (hypoglycemia) can eventually lead to brain damage. Low blood sugar level is encountered during period of vigorous exercise, fasting, excess insulin, or alcohol consumption. This underscores the need to provide enough carbohydrates during such periods.

How many carbohydrates do you need?

Carbohydrates contribute 50 to 80% of the calories in the present-day American diet. No wonder *Atkins' Diet* worked for so many, especially when they were forced to reduce their total calorie intake by 60 to 70%. *However, other cardiologists and I myself strongly disagree with Atkins' unrestricted fat recommendations.* Numerous studies have shown a direct correlation between increased saturated fat intake and increased heart disease incidence.

The rationale for a low carbohydrate diet does have some merit. Low carbohydrate diet forces you to cut empty calories that you do not need. However, I feel there is no need to load your system with excess fatty foods. Your body has the ability to mobilize its own fat in an orderly manner during a low carbohydrate diet intake.

Ironically, most people do not need a lot of carbohydrates to survive. Contrary to the US Government's diet guideline recommendations that 50% to 60% of your daily calories come from carbohydrates, you can survive on a diet with less than 50 g carbohydrate per day. The human brain, which primarily depends on glucose for its energy, can survive on stored fatty acids during

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prolonged periods of fasting or during low carbohydrate diets. Your body has the ability to produce glucose using fatty acids or amino acids. As mentioned elsewhere, your body needs about 200 grams of carbohydrates per day. If you keep your carbohydrate intake to less than 200 g per day, then your body will be forced to burn fat from within. Thus, mobilizing your own body's fat will promote weight loss. Restrict your carbohydrate intake between 50 and 100 g when you are trying to loose weight. On the other hand, if you are trying to maintain your current weight, then you can increase your carbohydrate intake up to 200 g per day. Please note that 200 g of carbohydrates provide nearly 800 calories. That is a lot of carbohydrate (empty) calories for someone trying to slim down his or her hip, waist, or both.

I also recommend that you evenly distribute your daily carbohydrate allowance among each meal. In other words, do not consume an entire day's carbohydrate allowance in one meal. Try to limit your carbohydrate intake to less than 30 to 40 g per meal. This will allow your body to burn all the dietary carbohydrates for immediate energy needs. Let your body burn **ITS OWN FAT** (Oh! Lard) between meals for its energy needs.

Snacking between meals with carbohydrate rich foods is a definite way to prevent weight loss. As long as your body is getting quick, cheep, and easy energy from carbohydrates, there is no need for it to take the extra effort to break down its own fat. People with low blood sugar problems may have to depend on five or six meals per day in order to keep up their blood sugar level. If you have special medical needs, please consult with your physician. Even those people with low blood sugar levels may benefit from choosing low Glycemic Index (GI) foods. These foods will maintain their blood sugar level over a longer duration than foods with high GI carbohydrates. If you must have a snack, then consider eating a low GI food (such as fruits, vegetables, or nuts) between your meals.

When you are hungry, avoid eating high GI foods. They will raise your blood sugar level quickly and stimulate excess insulin production. Pay special attention to butter or margarine that you add to your breads, potatoes, or rice to make them more palatable. These spreads are high in fat calories. Choose an alternative such as a low calorie dressing to reduce your total fat calorie intake.

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As you exercise, your muscles first burn glucose for energy and then switch to glycogen in the muscle or liver. During periods of vigorous, energy-demanding activities, you can increase your carbohydrate intake to match your caloric demand. If you do not provide extra carbohydrate calories, then your body will burn more fat, increasing your weight loss. Hence, exercise should get as much attention as your diet when you are trying to slim your waist or hip. Since regular and sustained walking burns fat calories, incorporate two to three mile walks throughout the day. Take one or two flights of stairs several times during your workday and shed a few pounds from your hemline, overtime!

Limit your intake of foods containing purified sugar: sweets, jams, soft drinks, cakes, biscuits, or ice cream (I know, what's left!). Carbohydrates in fruits and vegetables are actually *unrefined* sugars. Fresh fruits and vegetables also contain vital phyto-chemicals and other micronutrients that protect us against serious illnesses such as heart disease or cancer. The fiber in fruit, vegetables, and pulses, also help lower your blood cholesterol level. Try to get the majority of your carbohydrate intake from this group. Take into account the carbohydrate content in the beans and lentils when planning your daily meals.

Among cereals, select Fiber One, All Bran, or oatmeal that has low glycemic index carbohydrates in addition to a high fiber content. Higher fiber content helps to lower your cholesterol level. Choose whole-wheat bread instead of white bread. Pick whole grain products such as whole-wheat bread, or pasta that contains the bran and germ. Ask for whole-wheat tortillas in place of white tortillas, brown rice instead of white rice, or Basmati rice as a substitute for instant white rice. Add fruits to your cereals, stews, or salads. Replace white bread or rice with beans or lentils in your lunch or dinner meals.

Endurance athletes need a carbohydrate-rich diet to maximize their muscle glycogen stores. Sucrose and dextrose restore glycogen stores more rapidly than fructose or other carbohydrates. Thus, pure glucose would be the preferred carbohydrate to consume during athletic events. Following activity, starches or high fiber carbohydrate sources are just as effective as simple sugars in restoring glycogen stores.

Thirty to forty grams of carbohydrates consumed during a meal contribute 120 to 160 calories. If you walk, jog, or do any kind of

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exercise, you will essentially burn all those calories. That will ultimately force your body to use excess body fat to provide energy between your meals. It makes perfect sense to spend a good amount of time on a dance floor after you over indulge yourself in a carbohydrate or fat-rich diet when you go to parties. Exercise burns those excess calories, makes you more energetic, and helps you to get a good night's sleep. You also can take a walk for thirty to forty minutes following a heavy meal, which will enable you to burn most of the excess calories that you consume. Here is another plan. Engage yourself in a moderately heavy exercise just before you go for a carbohydrate-rich dinner. By exercising you burn most of the carbohydrates and deplete your body of glycogen stores so that any excess carbohydrates you eat will replenish those glycogen stores, instead of turning into fat.

Sugar: Sugar sold in the market, is a carbohydrate with one glucose and one fructose unit. It has a Glycemic Index (GI) of 50, in contrast to white rice with an 86 GI or a carrot with 103 GI. Sugar raises your blood glucose level at a slower pace than white rice, rice crispies, or a carrot. Then why do so many people consider sugar to be bad? If you use it in moderation, it is neither bad nor good. It gets bad when you indulge in a can of soda containing an equivalent of nine teaspoons of sugar or your favorite desert containing 40-50 g of pure sugar per serving.

While sitting in a doctors' dining room, it amazes me to see some of my colleagues put three, four, or even five teaspoons of sugar in their ice tea or coffee, in addition to five or six servings of Half and Half. They are not concerned about the empty calories, despite having a full knowledge of its implications. I try not to share my views, since I am a minority in the group. Some of them say, "Man! Someone can sit and count calories all day long, and then get hit by a truck or develop a cancer. You gotta enjoy while you can. Ah Man!" Well, I do have some recommendation for those with a sweet tooth affliction. If it is the sweetness you are after, then consider sugar substitute.

Sugar Substitutes: One teaspoon of *Equal* has the sweetness of two teaspoons of sugar, while one teaspoon of *Splenda* has the same sweetness as a teaspoon of sugar. If you need more than two teaspoons of sugar, opt for sugar substitute so you can continue to enjoy your coffee or dessert. Yes, the sugar substitute does taste unusual, but after two or three weeks, you will get accustomed to it. Once your body is

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acclimated to the new taste, then you will not miss your dear sugar. Many different sugar substitutes including, Equal, Splenda, Sweet 'n Low, and Nutra-Sweet. Aspartamine have been linked to cancer in experimental animals, though not proven in human beings.

Breads: They not only form the foundation of the diet pyramid, but also largely contribute to our large silhouette contour. They are the major sources of our daily carbohydrate excess. They come in many shapes and sizes. We consume breads for breakfast, lunch, and dinner. Most snacks contain carbohydrates. Breads surround us whenever we sit at the dinner table. If you intend on cutting your excess calories, this is the right place to start.

One slice of white bread has 11-14 g of carbohydrates and 70 calories; while a large bagel has 75 g of carbohydrates with 300 calories per serving. On the other hand, a slice of whole-wheat bread may have 10 g of carbohydrates, 2-3 g of fiber, 3-5 g of protein, and 50 calories. You do not need to travel 50 miles across town to a health food store to find such items. You can find them in the regular bread section of most supermarkets. It does pay to read labels. If you look long enough, you will find a brand that has a combination similar to the one described above. I have even found tortillas that have 10-12 g of carbohydrates, 8-12 g of fiber, and 50 calories per serving. How about that for a heart-healthy choice? "Yes, but it tastes like grass!" say, my friends. If you think that 75 g of carbohydrates in a bagel tastes better than 10 g of carbohydrates in a whole-wheat toast, then it is not only the taste, but also your love affair with carbohydrates and calories that needs rehabilitation. You can easily reduce 40-50% of your daily calories from carbohydrates by making the right heart-healthy choices. The tables at the end of this chapter provide you with a wide range of choices for low calorie carbohydrates with high fiber contents.

Rice: I grew up in India eating rice products for breakfast, lunch, and dinner. Most of our snacks are made up of rice flour. Is rice bad? White rice, with a GI of 86, raises your blood sugar level quickly by stimulating Insulin production. The second major problem has to do with quantity. Since cooked rice does not come in known measures, there is a tendency among rice eaters to keep on eating until their stomach cannot accommodate any more. I know this from personal experience. The situation gets worse when your mind is preoccupied in an intellectual debate with your snobby friend at a dinner table during a

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weekend party. On the way home, when you tell your spouse, “Pass the antacid, please” you know you overdosed on rice at the dinner party. Unfortunately, this repeats day after day at home and on weekends at parties. It is very hard to control rice addiction when you are sitting in front of a pot full of fresh, hot rice! After careful review of nutritional literature, I have a few observations that might help you in this area. First, make sure that your spouse serves you only half-a-cup of cooked rice per meal. If you want extra rice, you better have a good reason! Second, use Basmati rice that has a lower GI (58) than white rice (86). Next, consider having whole-wheat bread or fiber-rich tortillas in place of white rice. Finally, combine rice with other foods so that you can reduce the overall GI of the food combination.

Potatoes: They along with corn are the major carbohydrate sources in the western world. Potatoes can be sliced, diced, crushed, chopped, mashed, or blended to please your palate. A Potato has a GI of 85. It raises the blood sugar level quickly. Most of the guidelines, outlined for rice, would also apply to potatoes as well.

Beans: They are an excellent protein source. They also contain carbohydrates in addition to salt and fiber. Whenever possible, substitute your pure carbohydrate serving with a bean serving. Look under vegetable sources of protein for complete information on beans.

Flour: Highly purified white flour has several disadvantages. It contains very small particles that increase the amount of surface available for the digestive juices and absorption. This increased absorptive surface raises the GI of the purified white flour. Leveling agents such as yeasts or baking soda further increase the amount of surface area available for the digestive juices. By contrast, pasta has a lower GI because of less having surface area than pure white bread. Surprisingly, whole-wheat bread has the same glycemic index as white bread. This is because whole-wheat bread contains insoluble fiber. Even then, whole-wheat bread has many advantages such as a higher fiber content, more vitamins, and minerals among others.

Fruits: The body’s ability to digest fructose, a common monosaccharide found in fruits and honey, is considerably less compared to pure glucose. Hence, supplying your carbohydrates in the form of fruits makes sense. Fruits provide a slow and steady supply of energy without putting an undue stress on your pancreas.

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Tacos: For the Mexican food lovers, I have some news. Tacos are high in carbohydrates (40 to 50 grams), high in fat (15 to 30 grams), and high in salt content, in the range of 800 to 1200 mg per taco. Moreover, if you consume two tacos, you have enough calories and carbohydrates to keep your body's engine running for the next 24 hours. You are better off eating a chicken or beef fajita with no tortillas and a glass of skim milk or plain water. A high carbohydrate and fat intake is a perfect recipe for promoting obesity.

Corn Syrup: Corn, being a major carbohydrate ingredient, deserves some comments. One half cup of corn contains approximately 20 g of carbohydrates and 2 g of protein. It has GI of 89. Restrict your consumption of corn to no more than 2 ounces of cooked product. A better choice would be to use fresh fruits and vegetables that have a lower GI in addition to fiber and enzymes.

Lean Cuisine: Be aware of the lean cuisine contents. Most of them emphasize low fat. Do not be misguided by low-fat or fat-free claims. The fat calories may have been replaced by carbohydrate calories. Whether calories come from carbs or fat add up. Remember that of frozen foods have a much higher salt content than their fresh counterparts. Consider the high salt content of frozen foods. The sauce and creams used in lean cuisines are generally made of carbohydrates that add many empty calories.

Stay away from packages that contain 60 to 80 grams of carbohydrates. Move to the next isle, store, or town where you can select a lean cuisine with less than 30 g of carbohydrates. Alternatively, use lunchmeats such as fat-less chicken, beef, or turkey to make your own sandwiches. You can find whole-wheat, fiber-rich bread that has less than 60 calories per slice. Then add your own vegetables. Become an educated consumer rather than falling pray to such marketing catch phrases as "Low-Fat" or "Fat-Free."

I realize that a construction worker digging ditches on the side of the road with his hands, in smoldering 100-degree temperature for 8 to 10 hours a day, needs a lot of calories. Believe me, he will not be shopping in the Lean Cuisine section. Do not worry about him!

Crackers: Crackers are a combination of refined carbohydrates and fat. Some of those better tasting crackers have 150 calories, 14-20 g of carbohydrates, and 6-8 grams of fat. Avoid these crackers when you are trying to cultivate a heart-healthy lifestyle. In place of crackers,

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try dry roasted, unsalted soybeans. It will satisfy your appetite while supplying some nutritious protein along with a small amount of carbohydrates and fat.

Pastries: Pastries look and taste great, and make you feel good. However, are they good for you? The marketing experts have figured how to increase your appetite and liking for these foods by enriching them with saturated fats, sugar, and possibly cholesterol. And, of course they are rich in calories! For example, a croissant has almost 300 calories. The story is the same with most other pastries. Hence, you can cut your carbohydrate and fat calories by minimizing the pastries in you diet.

In summary, Carbohydrates do provide quick energy. Contrary to the convention wisdom that 50-60% of our calories come from carbohydrates, carbohydrates are not essential for survival. Human body can manufacture carbohydrates from other sources. Most of the obesity problem in this country is related to overindulgence in carbohydrates and fat-rich foods. As a first step toward a heart-healthy lifestyle, I would suggest taking a serious second look at your carbohydrate inventory. Second, replace most of your high GI carbohydrates with low GI carbohydrates. Next, reduce the daily carbohydrate consumption to about 50-100 grams. Finally, ingest most of your carbohydrates in the form of vegetables and fruits.

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Glycemic Index (GI) of Foods (Select foods with less than 50 to 60 GI)

Foods	Ser Size	Carb(g)	GI
All-Bran, breakfast cereal	½ cup	15	30
Apple, 1 medium	4 oz.	15	38(avg)
Apple juice, pure, clear, unsweetened	250ml	30	44
Basmati rice, white, boiled	1 cup	38	58
Black-eyed peas, canned	2/3 cup	17	42
Cereal—hot, apple & cinnamon	30	22	37
Carrots, mean of four studies, raw	1 med.	6	47
Chickpeas, canned	2/3 cup	22	42
Cucumber	¾ cup	0	0
Fructose, pure	1 Tbsp	10	19(avg)
Grapefruit, raw, medium	½	11	25
Green peas	1/3	7	48
Hamburger bun	1.5 oz	22	61
Hot cereal, unflavored	1.2 oz dry	19	25
Ice cream, low fat, vanilla, "light"	½ cup	9	50
Kidney beans	¾ cup	18	46
Lentils, green, boiled	¾ cup	17	30(avg)
Lima beans, baby, frozen,	¾ cup	30	32
Low fat, fruit, aspartame	200	13	14
Macaroni, cooked	1 ¼ cups	48	47(avg)
Milk, skim	8 oz	13	32
Mousse, mango, 1.8% fat-oz	1.75	11	33
Mousse, mixed berry, 2.2% fat oz	1.75	10	36
Mousse, Strawberry, 2.3% fat oz	1.75	10	32
Multi-Grain (9-Grain) bread	1 oz	14	43
Noodles, mung bean, dried, boiled	1 ½ cp	45	39
Oatmeal	1 cup	21	42
Orange, medium	4 oz	11	42(avg)
Peach, fresh, large	4 oz	11	42(avg)
Peanuts, roasted, salted	1.75 oz	6	14(avg)
Pear, raw	4 oz	11	38(avg)

Calories: Carbohydrates=4, proteins=4, fats=9, and alcohol=7.

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Glycemic Index (GI) of Foods 2 (Select foods with less than 50 GI)

Foods	Ser	Carb (g)	GI
	Size		
Pinto beans, dried, boiled	¾ cup	26	39
Plums, raw	2 med	12	39
Ravioli	6.5 oz	38	39
Rice, brown, steamed	1 cup	33	50
Rice noodles, freshly made, boiled	1 ½ cups	39	40
Rye bread	1 oz	14	58(avg)
Smoothie drink, banana	250ml	22	30
Smoothie drink, raspberry	250ml	41	33
Soy (milk, full fat, Original or Natural)	250	17	44
Soybeans, dried, boiled	1 cup	6	20
Spaghetti, white, boiled 5 min	1 ½ cups	48	38(avg)
Spaghetti, whole wheat	1 ½ cups	44	32
Split pea and soy pasta shells,	1 ½ cups	31	29
Split peas, yellow, boiled 20 min	¾ cup	19	32
Super Supreme pizza, thin & crispy	1 slice	22	30
Tapioca, boiled with milk	¾ cup	18	81
Whole Grain (100%) bread	1 oz	13	51
White bread+15g psyllium fiber	30	17	41
Yogurt, low fat, fruit, with artificial sweetener	8 oz	15	14

Calories: Carbohydrates=4, proteins=4, fats=9, and alcohol=7.

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High Glycemic Index (GI) Foods (Minimize foods with greater than 50 GI)

Foods	Ser Size	Carb (G)	GI
Broken rice, white	1 cup	43	86
Cantaloupe, raw	4 oz	6	65
Clif Bar (cookies & cream)	2.4 oz	34	101
Corn Flakes-Honey Crunch cereal	1 cup	24	72
Corn Pops, breakfast cereal	1 cup	26	80
Crispix, breakfast cereal	1 cup	25	87
Desiree potato, peeled, boiled 35 min	5 oz	17	101
Doughnut, cake type	one	23	76
English Muffin bread	1 oz	14	77
French baguette, white, plain	1 oz	15	95
French fries, frozen	30 pcs	29	75
Gatorade (orange) sport drink	8 oz	15	100
Glucose tablets	3 pcs	15	102
Gluten-free white bread, sliced	1 oz	13	79
Glutinous rice, white	2/3 cp	48	92(avg)
Instant potato, prepared	¾ cp	20	85(avg)
Instant rice, white, cooked 6 min	¾ cp	42	87
Jasmine rice, white,	1 cup	42	109
New potato	5 oz	21	78
Pancakes, prepared from mix	2-4" pan	58	67
Parsnips	½ cup	12	97
Potato, baked	5 oz	30	85(avg)
PowerBar (chocolate)	2.6 oz	42	83
Pretzels, oven-baked	1 oz	20	83
Puffed Wheat, breakfast cereal	2 cups	21	80
Rice, parboiled	1 cup	36	72
Rice Crispies, breakfast cereal	1 ¼ cups	26	87
Rice pasta, brown, boiled 16 min.	1 ½ cups	38	92
Rice, Instant, white, cooked 6 min	¾ cp	42	87
Rice, Jasmine, white	1 cup	42	109
Roll (bread), Kaiser	½	16	73
Roll-ups, processed fruit snacks	1oz	25	99

Carbohydrates

Shredded Wheat, breakfast cereal	2/3 cup	20	75(avg)
Soda Crackers, premium	5 crackers	17	74

Calories: Carbohydrates=4, proteins=4, fats=9, and alcohol=7.

Nikam's Heart Healthy Diet

High Glycemic Index (GI) Foods (Minimize foods with greater than 50 GI)

Foods	Ser Size	Carb (G)	GI
Stuffing, bread	1 oz	21	74
Total, breakfast cereal	$\frac{3}{4}$ cup	22	76
Vanilla wafers	6	18	77
Waffles	1	13	76
Watermelon, raw	4 oz	6	72
Wheaties, breakfast cereal	1 cup	21	82
White bread	1oz	14	70
Whole-wheat bread, wheat flour	1 oz	12	77
Doughnut, cake type	47	23	76
Corn muffin, low-amylose	57	29	102
Pancakes, buckwheat, packet mix	77	22	102
Scones, plain (packet mix)	25	9	92
Coca-cola, soft drink/soda	250ml	26	63
Cranberry juice cocktail	250ml	36	68
White flour	30	14	70
Lebanese bread, white	30	16	75
Middle Eastern flatbread	30	16	97
Wheat flour flatbread	30	16	66
Amaranth: wheat composite flour	30	15	76
Corn Flakes (Kellogg's)	30	26	92
Cream of Wheat	250	26	66
Amaranth popped, with milk	30	22	97
Long grain, parboiled	150	37	75
Banana, ripe (all yellow)	120	25	51
Dates, dried	60	40	103
Tapioca, boiled with milk-cup	$\frac{3}{4}$	18	81

Calories: Carbohydrates=4, proteins=4, fats=9, and alcohol=7.