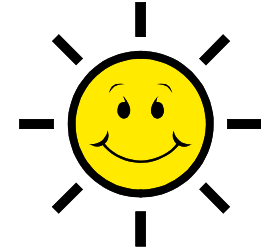


C

hapter 3

Carbohydrates

Start With the Sun



To explain the term **carbohydrate**, start with the Sun. Sunlight strikes a leaf and through a complex process -- not yet completely understood -- the energy in the sunlight is used by Chlorophyll (the green coloring matter in the leaf) to manufacture carbohydrate out of the carbon dioxide in the air and water taken up from the soil. This is called ***photosynthesis***.

According to some, if we knew how to duplicate the process of photosynthesis in a laboratory, no one would go hungry again. **Carbohydrates are the most abundant organic substances.** Carbohydrate makes up the structural parts of plants in the form of **cellulose** as well as stores of **starches** and **sugars**. Carbohydrates are complex molecules composed of Carbon, Hydrogen and Oxygen.

The Science of Mother Nature

During **daylight** hours, green leaves take up **carbon dioxide** from the air (put there when we breathe). At **night** the leaves produce **oxygen** as well as **sugars** and **starches** plus **cellulose matter** that helps the plants stand up and grow larger.

Without this process throughout the plant kingdom, there would be no natural sugars and starches. We would have to obtain energy from **protein** or **fat**.

You'll understand, as you learn more about nutrition, that all life-preserving processes and substances cannot survive **without each other**. **Protein** is needed to grow new tissue. **Fat** provides fat-soluble vitamins and protection as well as energy. So the cycle goes. All processes and portions serve one another.

Carbohydrates provide about **half** the caloric energy intake for most Americans. In Oriental cultures, carbohydrates provide about **four-fifths** of the calories (or energy). Americans eat more meat. The energy for us comes from starches and sugars.



A World Without Carbohydrates?

Try to imagine all meals without carbohydrates: No starches and sugars, such as **bread, cake, cookies, pastries and puddings; breakfast cereals, macaroni, rice, spaghetti, noodles, fruits and vegetables, jellies and jams, candies and sweetened beverages.**



Shocking? Yes. These are important energy sources. And **your body** constantly needs energy.

Some People Have the Wrong Idea

Many people think that to lose weight they must **reduce** carbohydrate intake. They cut down on bread, cereals and sugars, etc. The truth is, there are **B Complex** vitamins in grains and cereals and other nutrients.

Reduced carbohydrates presents another complication. If you cut down on carbohydrates and, thus calories, you'll lose weight, but, you'll also "**shrink.**" This is because tissue will not be **repaired** and **replaced** properly. Only when the body has enough **carbohydrate** will it allow **protein** to build new tissue. When carbohydrate intake is reduced, some of the protein is used to provide energy. As a result, tissue loses its ability to **repair** and **rebuild** properly. It's dangerous to tamper with one nutrient because it affects many others at the same time.

A Recurring Theme

A recurring theme in your personalized program is "**balance.**" There is a balance in the human system that must be maintained. It varies for different people. And that balance also is "governed" by certain endocrine glands such as the **thyroid** and **adrenal** glands. Deprive your body of a given nutrient -- too often and too long -- and the balance becomes disturbed. In addition, other glands and processes in the body begin to **strain** in an attempt to keep-up their normal duties while trying to compensate for the missing nutrient.

Carbohydrates are broken down and transformed into simple sugars. Some of the glucose (blood-sugar), is used as fuel by the **brain, nervous system** and **muscles**. A small portion of glucose is converted to glycogen and stored in the liver and muscles. The excess is **converted into fat** and stored throughout the body as a **reserve source of energy**.

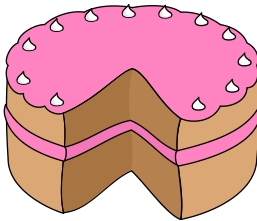
“But, What About My Snacks?”

Carbohydrate **snacks** that contain **large amounts of refined sugars** and **starches** promote a **sudden rise in blood sugar levels**. Thus, they provide the body with an immediate source of energy. The "**insulin spike**" that follows rapidly **lowers** the blood sugar levels. This results in cravings for more sugary foods. The end result usually is **fatigue, dizziness, nervousness** and **headaches**.



Over indulgence in starches and sweet foods may suppress the desire for other essential nutrients. Often this results in nutritional **deficiencies, obesity** and **tooth decay**. Diets that are **high in refined carbohydrates** are usually **low in vitamins, minerals** and **cellulose**.

“I’ll Eat Enriched Bread”



Foods such as **white flour, white sugar** and **polished rice** are *lacking* in the B vitamins and other nutrients. Excessive consumption of these foods will perpetuate already existing vitamin B deficiency conditions. Enriched products usually include some of the B vitamins. If the B vitamins are absent, however, carbohydrate digestion cannot take place, resulting in **indigestion**, symptoms of **heartburn** and **nausea**.

Individual variations including **rate of metabolism, activity level, body weight** and **body consumption** will significantly influence the total amount of carbohydrates necessary for an individual to function at an optimal level.

A **total lack of carbohydrates** may promote **ketosis, loss of energy, depression**, and the **breakdown of lean body tissue**.

Digestion of Starch

The digestion of starch in carbohydrates begins in the **mouth** and then continues in the **small intestine**. As mentioned earlier, the main product of carbohydrate metabolism is **glucose, or blood-sugar**. In this form it enters our blood stream and first supplies the energy needs of our **central nervous system**. Any glucose not used **immediately** is **stored** in the **liver** or **muscles** as **glycogen**. The excess is converted to **fat** and **stored**

throughout the body. Glycogen reserves are important because this is the primary fuel of hard working muscles, and supply of it is limited.

The body can store only a **limited supply of glycogen:** approximately 350 grams when the supply is at its peak. One-third of the amount is **stored in the liver** and the remainder in the **muscles**. Liver glycogen is available for **immediate** use. It is quickly converted into **glucose** when needed by the body. Muscle glycogen, however, **does not have the necessary enzymes** for this direct secretion into body fuel. It furnishes glucose indirectly. When the muscle contracts, glycogen is converted into **Lactic Acid**. The Lactic Acid is carried in the bloodstream to the liver and then **converted** into glycogen or glucose as needed by the body. For this reason, it does not reach the brain and nervous system as directly as liver glycogen.

The **reserve** of glycogen lasts 2-15 hours, depending on activity levels. Someone playing checkers can have enough to last most of the day. Body-builders in heavy training can use their entire supply of glycogen within 2-3 hours. The body will then *switch* to alternate, but, less efficient energy fuels. Muscle protein, for instance, can be *converted by the liver into glucose* in order to keep the brain and nerves supplied with fuel. However, this puts unnecessary *stress* on the liver. It also drains the supply of amino acids needed for building muscle and repairing the body.

Fresh Fruits and Vegetables are Best



It is natural carbohydrates from **fresh fruits** and **vegetables** that are needed on a regular basis to replenish energy for the nervous system. Without it, the nervous system becomes highly irritated.



Refined carbohydrates, like sugar, are so concentrated that they overload the system. The body is equipped to store only **limited** amounts for energy needs. Cakes, pie, candy, and soda cause the blood sugar to rise. Your body responds by producing **insulin**, a hormone causing a rapid drop in the blood sugar level. The release of too much insulin is always a shock to the body. The “see-saw” rising and lowering of blood sugar levels wrecks havoc with the nervous system, causing a loss of stability.