

# **Carbohydrates are the Preferred Fuel in Fire Fighting!**

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Carbohydrates are receiving bad press these days - just like they did in the 70's. Many of you will remember the first Star Wars movie, your first pair of bell bottom jeans and platform shoes - You may also remember that carbohydrates in the form of sugar was blamed for people having the blues and hyperactivity in children! Today, sugar is taking a beating for causing diabetes, obesity and a host of other diseases.

Unlike in the 70's, today our country battles bulging waist lines in spite of all the "free" and "reduced" foods available. One researcher from the University of Ohio believes Americans eat approximately 200 extra calories/day from these special foods. More recently, Kelly Brownell, Ph.D., one of the nation's leading health experts, feels that the media is pressuring people to over eat which leads to obesity. Brownell blames a "toxic food environment" in which Americans have access to a poor diet - to high-calorie foods that are widely available, low in cost, heavily promoted, and good tasting. These ingredients produce a predictable, understandable and inevitable consequence - an epidemic of diet-related diseases.

## **In Defense of Carbs!**

Carbohydrates are necessary in the diet primarily to supply energy. In addition, they are naturally low in fat, while high in fiber, vitamins, minerals, electrolytes and antioxidants. They supply only 4 calories/gram just like proteins and fats provide 9 calories/gram. When eaten in excess of the bodies calorie needs, all these nutrients will be stored as fat. There are two different types of carbs in foods: simple, such as table sugar (sucrose), fruit (fructose) and milk (lactose)sugars; and complex carbs, known as starches, in breads, cereals, potatoes, beans, pastas and cereals.

After eating either simple or complex carbs, your body breaks them down into glucose which circulates in your bloodstream. Your body either uses it for energy right away, stores it in your muscles and liver as glycogen or in your body as fat. When you are in need of glucose to maintain blood sugars or for energy, your body breaks down the glycogen first and then the fat.

Athletes get most of the energy that their muscles need from carbohydrates. Carbs are the only foods that can be metabolized anaerobically. During the first five minutes of exercise, blood glucose is the fuel being used. To continue, the body then turns to it's storage form of carbs, glycogen, which is found in the liver and muscles. The glycogen stored in the liver helps regulate blood glucose levels, while the glycogen in the muscles are used directly by the muscles to allow the exercise to continue.

From about five minutes to 19 minutes the body mixes the fuels being used and once activity continues beyond 20 minutes, fat is the primary fuel. Amino acids can also be used for exercise. But, they are not the preferred fuel.

Both training and diet are important to optimize athletic performances. Dietary intake provides the body with the necessary fuels, while training improves the body's utilization of the fuels. The more fit a person is, the less glycogen they use, the longer they can exercise.

## **For the Firefighter!**

In firefighting, carbs provide energy when oxygen is hard to breathe. Because carbs do not require oxygen to burn for energy, they are the preferred fuel during short, intense bursts of energy. It takes 6 molecules of oxygen to burn 1 sugar molecule which produces 36 ATP. Adenosine triphosphate (ATP) when broken down releases energy allowing you to do work. The more ATP released the more energy available to the working muscle. With fat as the primary fuel, however, 26 molecules of oxygen are required to burn 1 fatty acid molecule which produces 147 ATP.

When first arriving at the scene of a live burn, you are ready to begin hard work. At the beginning you do not have enough oxygen available in your cells, so your body turns to glycogen in your muscles and blood for energy. As you continue to work and become more acclimated to your environment, oxygen enters your cells and now you begin using stored fat. The longer you work, the more fat you burn.

After a long, intense workout your body will begin to fatigue and you will return to using the remaining stores of carbohydrates. When you run out, you "hit the wall" and can no longer work. So, the more stored carbohydrates you have the longer you can work. And, the more fit you are, the longer you can exercise!

To delay exercise fatigue - stick with carbs! Research has shown that when cyclists were provided with a 6% carbohydrate drink, 12% carbohydrate drink or water placebo, those with the carbohydrate containing drinks were able to delay the onset of fatigue by one hour!

## How many Carbs do I need?

Your diet should contain at least 6 gm of carbohydrate/kg of weight per day. This amount is enough to replenish muscle glycogen stores when working hard for one hour/day. If you work harder than that, the recommendation is 8-10 gm/carbohydrate/kg/day.

Weight (lbs.)	Weight (kg.)	@ 6 gm/day	@8 gm/day	@ 10gm/day
150	68	409	544	680
160	73	436	584	730
170	77	464	616	770
180	82	490	656	820
190	86	518	688	860
200	91	545	728	910
210	95	570	760	950
220	100	600	800	1000

In conclusion, a calorie is a calorie is a calorie. If you over consume your daily calorie needs, your body will store those calories as fat. No matter if those calories came from low fat foods, protein foods or fatty foods. Carbs are an excellent source of readily available energy needed for firefighters to perform effectively. The better fit the firefighter is, the more productive they will be.