

Growing Your Ability to Balance Carbohydrates

By Young Ju, Ph.D.

A carbohydrate is a macronutrient. Macronutrients are the nutrients that the body needs to generate energy and to maintain the body's function. Three types of carbohydrates provide energy: sugar, starches, and fiber. When we eat a food containing carbohydrates, the digestive system breaks it down into glucose, which enters the bloodstream. Glucose is a single sugar unit (called **monosaccharide**). As blood glucose levels rise, the pancreas releases insulin, a hormone that facilitates the body's cells in uptaking glucose from blood and using it for energy or storage.

Carbohydrate intake is crucial to tennis players. Setting up a carbohydrate-intake strategy is complex because there are many factors that could affect energy consumption during matches, including temperature, court surface, playing style, and individual's nutrients and health conditions, etc. In general, competitive tennis players burn 664 (\pm 118) and 973 (\pm 157) calories during a 90-min match for women and men, respectively (Ranchordas et al., 2013). It is recommended that **competitive** tennis players take ~3 grams of carbohydrate per pound of body weight each day (equivalent to 465 grams for a 155-lb or 70-kg person); 30-60 g per hour during matches.

The key is balance. Depending on whether you need long-term energy (10+ hours) or a quick-energy supply (seconds to minutes), you would choose different carbohydrate sources. Depending on the chemical structure and rate of digestion and absorption, carbohydrates can be categorized into either simple carbohydrates or complex carbohydrates (Table 1). Typically, sports drinks contain about 14-18 g simple sugar in 8 oz. Energy bars contain about 23-44 g simple sugar in 1 bar.

Table 1. Simple Carbohydrates vs. Complex Carbohydrates

Simple Carbs: One Sugar (Monosaccharides) or Two Sugars (Disaccharides)	Complex Carbs: Three or More Sugars (Oligosaccharides or Polysaccharides)
<p>Refined sugar, candy, sugar-sweetened beverages, syrups—some simple sugars (naturally occurring sugars) are more nutritious in foods (e.g., fruit and milk).</p> <ul style="list-style-type: none">• quickly digested and converted to glucose• faster rise in blood glucose• easily and quickly utilized for energy	<p>Legumes, starchy vegetables (e.g., potatoes), whole grains—many complex carbohydrate foods also contain fiber, vitamins and minerals.</p> <ul style="list-style-type: none">• slowly digested and converted to glucose• slower rise in blood glucose• feel full longer

However, looking at simple and complex carbohydrates does not fully explain how different kinds of carbohydrates directly affect blood glucose. The glycemic index is considered a better way of categorizing carbohydrates. The glycemic index ranks carbohydrates on a scale from 0 to 100 based on rate and amount of glucose levels after eating as shown in **Table 2**.

Low Glycemic Index (≤55)	Medium Glycemic Index (56 – 69)	High Glycemic Index (70-100)
Slowly digested Slower rise in blood glucose		Rapidly digested Faster rise in blood glucose

Glycemic load refers to the amount of **fiber** in carbohydrate foods. A glycemic load is calculated by multiplying its glycemic index by the amount of carbohydrate excluding fiber. Thus, for long-term energy, a player would choose foods with a low-glycemic load; foods with a high-glycemic load are used for a faster boost in energy. **Table 3** shows low-, medium-, and high-glycemic load foods.

Low-Glycemic Load (≤10)	Medium-Glycemic Load (11-19)	High-Glycemic Load (20+)
Bran cereals, low sugar fruits and vegetables, legumes, nuts, skim milk	Pearled barley, brown rice, oatmeal, bulgur, rice cake, whole grain bread, whole grain pasta	Baked potato, French fries, refined breakfast cereal, sugar-sweetened beverage, candy bars, white rice, white flour pasta, ripened high sugar fruits

For players who have prediabetes or diabetes, the general carbohydrate intake recommendation for tennis players may not be applicable due to their impaired glucose metabolism. In diabetic athletes, consumption of a low glycemic load food a few hours before exercise and an additional 15-30 g of carbohydrates in the hour before exercise may be recommended. For exercise lasting longer than 60 minutes, an additional 30-100 g of carbohydrates may be needed, depending on the intensity of the exercise, body weight, oral medications or insulin, and blood glucose levels. More frequent blood glucose check is also recommended (Sarker, 2016).

People at risk of diabetes or other health problems should talk to their healthcare providers about carbohydrate intake. As always this information is provided for your reference and you use at your own risk; you should rely on your medical professional for medical advice.

References

Glycemic Index <https://glycemicindex.com/>

Ranchordas, MK, Rogerson, D, Ruddock, A, Killer, SC, and Winter, EM. Nutrition for Tennis: Practical Recommendations J Sports Sci Med. 2013, 12(2): 211–224.

Sarker, SK. Carbohydrates and the diabetic athlete. 2016
https://www.researchgate.net/publication/309396260_Carbohydrates_and_the_Diabetic_Athlete



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