**Quick Reference Guide to Standard 3--Carbohydrates**

**Standard 3—Sources and functions of carbohydrates and fiber**

*Carbohydrates are the predominant component of most plant foods and come from grains, legumes, fruits, vegetables, nuts, and seeds. In addition, lactose is a carbohydrate in milk and some milk products. Another source of carbohydrates are foods with added sugars and caloric sweeteners. Carbohydrates divide into simple carbohydrates (sugars), and complex carbohydrates (starches and fiber). Important points for this standard:*

*1. Simple and complex carbohydrates—simple are sugars: mono- and disaccharides with glucose, fructose, and galactose as the monosaccharide building blocks. Sucrose is a disaccharide of glucose and fructose. Lactose is a disaccharide of glucose and galactose. Complex carbohydrates are starches, made of huge chains of glucose, and fiber such as cellulose (nondigestible), hemicellulose and pectin (both partially digestible).*

*2. Carbohydrates provide 4 kcal of energy per gram and should be 45-65% of our daily intake.*

*3. Fruits, vegetables,* ***whole*** *grains and legumes are carbohydrate-rich foods that are “nutrient dense” or “nutrient rich.” Foods low in fiber, high in simple sugars or refined starches are “nutrient poor” or “empty calories.”*

*4. Digestion of carbohydrates takes place mostly in the small intestine. Simple sugars are quickly digested. Complex starches are digested more slowly.*

*5. Fiber is vital to the health of the GI tract as the roughage moves the food through the intestines. Recommendation for fiber intake: 38 grams for males and 26 grams for females.*

*This standard is one of the fun basic cooking standards: breads, muffins, rice, pasta. It is also amazing how many desserts are made from carbohydrates! Bon appetit!*

***Objective 1—Identify sources and functions of carbohydrates***

<http://www.cdc.gov/nutrition/everyone/basics/carbs.html> Basic information on the functions and sources of carbohydrates.

[Carbohydrate School Tour Lab, 2015](https://www.dropbox.com/home/FCS--Foods%20and%20Nutrition%201/STANDARD%203--Carbohydrates%20and%20Fiber?preview=STANDARD+3+Carbohydrate+Lab+adapted+from+Sue+Reber%2C+2015.docx) A virtual tour adapted in 2015.

***Objective 2—Identify sources and functions of fiber***

<http://www.cdc.gov/nutrition/everyone/fruitsvegetables/nutrient-info.html> This is specific information on fruits and vegetables (sources and functions) and their role as high-fiber carbohydrates.

***Objective 3—Apply concepts in making quick breads, rice, grains and pasta***

<http://www.bioedonline.org/videos/lesson-demonstrations/human-organism/food-nutrition-and-energy/energy-for-life/>A 10 minute video of an easy yeast lab to show energy by graphing the height of the foam and the increase in temperature.

[Leavening Lab Demo](https://www.dropbox.com/home/FCS--Foods%20and%20Nutrition%201/STANDARD%203--Carbohydrates%20and%20Fiber?preview=Leavening+Agents+Demonstration+2015.docx) Leavening Agent Demonstration 2015 using yeast, water bottles and balloons. Reactions discussion.

***Performance Objective 5—Participate in preparation and comparison of nutrition and cost of convenience food vs. scratch food of complex carbohydrates.***

[Nutrient and Cost Comparisons--Mac and Cheese](https://www.dropbox.com/home/FCS--Foods%20and%20Nutrition%201/STANDARD%203--Carbohydrates%20and%20Fiber?preview=Nutrient+and+Cost+Analysis+of+Macaroni+and+Cheese%2C+June+2015.docx) Homemade Deluxe Mac and Cheese (full and reduced and lowfat) vs. Kraft Deluxe Macaroni and Cheese vs. Stouffers Microwaveable.

**Vocabulary for Standard 3**

**Amylopectin:** A very large and highly branched chain of glucose molecules. Amylopectin can contain up to 1 million glucose molecules. Amylopectin gives short-grain rice its sticky quality, but does not form strong gels.

**Amylose:** A long, mostly straight chain of glucose molecules. Amylose typically contains between 200 and 15,000 glucose molecules. Amylose forms strong gels, like those from corn starch.

**Carbohydrate:** Energy source created in large amounts only by plants\*, made from carbon, hydrogen, and oxygen in the general ratio 1:2:1. The smallest unit of carbohydrate is a sugar. Nutritionally, carbohydrates provide 4 kcal per gram. [\*Technically animals/humans also synthesize carbohydrate in the form of glycogen, but the typical definition focuses on plants.]

**Complex carbohydrate:** A carbohydrate made up of multiple glucose units. Complex carbohydrates take longer to digest than sugars. Complex carbohydrates are also referred to as *polysaccharides*.

**Fiber:** A diverse group of highly large and complex carbohydrates that provide structure to plants (plant “skeletons”). Common fibers include pectin, cellulose, and food “gums”. Fiber is classified as soluble or insoluble. Depending on its structure, fiber provides between 0 (e.g. cellulose) and 3 (e.g. pectin) kcal per gram.

**Fructose:** Monosaccharide also known as fruit sugar. Fructose is unique in that it forms a 5-membered ring (it does still contain 6 carbons) while other common sugars form 6-membered rings. This makes it more intensely sweet than other monosaccharides.

**Galactose:** Monosaccharide found most commonly in milk sugar.

**Gelatinization:** The process where starch is released from granules by cooking with water. Ungelatinized starch will not thicken or form gels, and gives a “raw” flavor to sauces or soups.

**Glucose:** Monosaccharide also known as blood sugar. Glucose is the building block for starch (amylose and amylopectin).

**Lactose:** Disaccharide also known as milk sugar. Consists of glucose and galactose.

**Maltose:** Disaccharide also known as malt sugar. Consists of two molecules of glucose.

**Quick Bread:** A baked good that relies on gelatinized starch and/or eggs for structure. Quick breads are tender and cake-like, and do not contain highly-developed gluten.

**Simple carbohydrate:** A carbohydrate made up of one to three sugar units. Simple carbohydrates are digested very rapidly. Simple carbohydrates are also referred to as *monosaccharides* (one sugar), *disaccharides* (two sugars), or *trisaccharides* (three sugars).

**Starch:** A polysaccharide made up of hundreds to millions of glucose units. Depending on the plant source, starch is a mixture of different percentages of amylose and amylopectin.

**Sucrose:** Disaccharide also known as table sugar. Consists of glucose and fructose.

**Sugar:** The smallest carbohydrate units: mono- and disaccharides. All common food sugars have the structure C6H12O6.

**Tunneling:** Defect in quick breads caused by overworking the batter. Tunnels are caused by overdeveloped gluten trapping leavening gasses and expanding.