Section 4

Purpose

Section 4 explains macronutrients and how they are broken down through the process of digestion. Students will have a chance to practice reading labels and figuring out calories from different types of macronutrients using an interactive calculator. This section explains how carbohydrate, a macronutrient, turns into glucose and affects the role of sugar in a healthy diet.

Equipment and Materials Needed

- Reserve the computer lab. You will need one computer for each student.
- Earphones are recommended.

Procedure

- Before class: Make sure the computers are functional and the website is open for the students to login.
- During class: Use the supplemental content to answer any questions that the students may have about the content.
- At the end of class: Help the students successfully log off and answer any questions they may have.

Supplemental Content

A. What Are Macronutrients?

Components of food that provide calories are macronutrients. These include fat, protein, and carbohydrate. Although alcohol also provides calories it is not considered a macronutrient because alcohol should not be a large part of caloric intake.

Fat provides nine calories per gram; protein and carbohydrate provides four calories per gram.

Fats: Dietary fat provides more than double the calories provided by carbohydrate and protein. Each gram of fat provides nine calories and carbohydrates and protein four calories per gram. The dietary guidelines for Americans recommend limiting total dietary fat to 20-35 percent of total calories. Certain types of fat are more harmful to health than others. The American Diabetes Association recommends limiting saturated fat to less than seven percent calories and dietary cholesterol to less than 200 mg/day. The main sources of saturated fat are food from animals, such as beef, pork, lard, butter, cream, milk, cheeses and a few plant oils (coconut oil, palm oil, palm
kernel oil, cocoa butter). The American Heart Association recommends limiting trans fat intake to less than one percent of total calories because of their effects on LDL levels. The main sources of trans fatty acids are processed foods such as snack foods or dessert, and to a limited extent in animal products.

**Protein:** Americans consume 15-20 percent of their energy in the form of proteins. This amount is not an issue for people with diabetes who have no renal impairment. However, when the kidney function is impaired, dietary protein restriction is recommended. The source of protein does not affect the kidney function, thus a healthy diet should include plant derived and animal derived proteins, choosing lean/low fat sources whenever possible.

**Carbohydrates:** The recommended range for carbohydrate intake is between 45-65 percent of the total caloric intake. Carbohydrate is an important source of energy and nutrients and restricting carbohydrate intake to less than 130 grams per day is not recommended because of the absolute requirement for glucose by the brain. The American Diabetes Association recommends including carbohydrates from fruits, vegetables, whole grains, legumes, and low-fat dairy to provide variety and nutrients. To achieve optimal blood glucose levels, a consistent carbohydrate intake at meals and snacks from day to day is necessary. In diabetics, insulin from injections and pumps should be matched to the carbohydrate intake.

Most food contains all three macronutrients. The exception to this includes foods that are all fat, such as margarine, oils, butter; and foods that are all carbohydrate, such as sugar, syrup, hard candy. Foods that are mostly protein contain some fat as well, if they are from an animal source (i.e., chicken), or some carbohydrate as well, if they are from a vegetable source (i.e. legumes).

A review is given of how digested food turns into glucose. The primary source of glucose is carbohydrates. If a carbohydrate food is eaten with a fat or protein, for instance peanut butter (protein and fat) with a cracker (carbohydrate), the blood glucose rise is slowed down.

**B. Is Sugar Bad?**

Sugar is a carbohydrate much like other carbohydrates. Sugar makes foods taste sweet, and many prefer the taste over non-sweet foods. Sugar has 4 calories per gram, just like other carbohydrates.

Sugar has no other vitamins or minerals, and so is considered "empty calories." Adding empty calories makes the food it is added to a more calorie-dense food. To help maintain calorie balance, added sugars should be eaten in moderation.

According to the Institute of Medicine, added sugars are those added to foods during processing or preparation. Added sugars include white sugar, brown sugar, raw sugar, corn syrup, corn-syrup solids, high-fructose corn syrup, malt syrup, maple syrup,
pancake syrup, fructose sweetener, liquid fructose, honey, molasses, anhydrous dextrose, and crystal dextrose.

Added sugars do not include naturally occurring sugars such as lactose in milk or fructose in fruits. The foods most often consumed with added sugars are soft drinks, cakes, cookies, pies, fruitades, fruit punch, dairy desserts, and candy (USDA/HHS, 2000). Added sugars should be limited for a healthy diet. The recommendation is for less than 25 percent of total calories to be from added sugar.

Those with diabetes do not have to avoid foods with sugar any more than people without diabetes. However, they need to include the calories in their daily meal plan, and balance the calories eaten with the calories expended in exercise the same as everyone else.

C. Read the Nutrition Facts Labels

Reading a food label helps to keep a check on calories and nutrients eaten every day.

*Serving size and servings per container:* The food label should be followed starting from the top by looking at the serving size and servings per container. The serving sizes are given in standardized units such as cups and pieces and followed by metric units (number of grams). Servings per container indicate how many servings the package contains. For example, this package of macaroni and cheese contains two servings.

*Calories:* The calorie section of the food label helps a person to manage weight. The portion amount determines caloric intake. For instance, if a person consumes a whole package of macaroni and cheese, then 500 calories have been consumed. The calories from fat indicate how many calories are coming from fats. In this package, almost half the calories are coming from fats.

**General Guide to Calories**

- 40 calories is low
- 100 calories is moderate
- 400 calories or more is high

*Limit These Nutrients:* The nutrients listed in yellow which include total fat, cholesterol and sodium should be limited because Americans consume too much of them. Eating too much fat, saturated fat, *trans* fat, cholesterol, or sodium may increase your risk of certain chronic diseases, like heart disease, some cancers, or high blood pressure.

**The Nutrition Facts Label - An Overview**
Most Americans don’t consume enough dietary fiber, vitamin A and C, calcium or iron in their diet. Calcium helps to reduce the risk of osteoporosis. A diet high in dietary fiber promotes healthy bowel function. Moreover, a diet plentiful in fruits, vegetables, and grain products may reduce the risk of heart disease.

Footnote: The footnote is not present on all the food labels but when present conveys the same information. It indicates how many grams of total fat, saturated fat, dietary fiber, carbohydrates and how many milligrams of cholesterol and sodium should be consumed when following either a 2000 calorie or a 2500 calorie diet. The daily values...
for some nutrients change but for cholesterol and sodium stays the same. The footnote gives the upper limits of the first four nutrients which are total fat, saturated fat, cholesterol and sodium. However, for the other two nutrients, dietary fiber and carbohydrates, at least the amount indicated on the label should be consumed.

Percent Daily Values (% DV): The percent daily values are based on the recommendations for key nutrients only for a 2000 calorie diet. These percent daily values can be followed even if the person consumes more or less than 2000 calories. A quick guide for following the percent daily value is that **5% DV or less is low and 20% DV or more is high.** The %DV column doesn’t add up vertically to 100%. Instead each nutrient is based on **100% of the daily requirements for that nutrient (for a 2,000 calorie diet).**

Supplemental Activity Online: Have students visit the Fun Place for games and activities to re-enforce concepts, especially HOT Review 1 and 2 macronutrients, and HOT 3 understanding diabetes.

Supplemental Activities Offline: Have food labels for students. Have them find the food labels that have particular features, such as lowest in fat, highest in calcium.