Chapter 11

Normal Nutrition

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TYPES OF NUTRIENTS

Families of a newly diagnosed person with diabetes are usually overly concerned and worried about what someone with diabetes should eat. They shouldn't be, as **the ideal diet for someone with diabetes (type 1 or type 2) is really just a healthy diet from which all people would benefit.** This chapter is meant to be a review of normal nutrition, which will help to improve the entire family's nutrition. It will be a good introduction to Chapter 12, Food Management and Diabetes. It will also make some of the words used by the dietitian easier to follow.

Foods provide different nutrients necessary for growth and health. If you know about these nutrients, you can help your family eat the right foods. Learning to read food labels will help you to know what you are buying at the grocery store. The Dietary Guidelines for Americans, 2005 is available online at: www.healthierus.gov/dietaryguidelines. Table 1 shows the main recommendations.

There are six major nutrient groups:

1. **protein**
2. **carbohydrate**
3. **fat**
4. **vitamins and minerals**
5. **water**
6. **fiber**

Our bodies need some of all of these nutrients, but in differing amounts.

TOPICS:
Nutritional Management

TEACHING OBJECTIVES:

1. **Present basic nutritional components including carbohydrates, protein and fat.**
2. **Introduce the importance of carbohydrate intake in diabetes management.**
3. **Present nutritional guidelines for fat/cholesterol intake and desired blood lipid ranges.**

LEARNING OBJECTIVES:

Learners (parents, child, relative or self) will be able to:

1. **List three major food components and give an example of each.**
2. **Explain the effect of carbohydrate intake on blood sugar levels.**
3. **Describe a dietary method to lower blood cholesterol/lipid levels.**

Table 1
2005 Dietary Guidelines:

Fruit and Vegetable Intake
(Fruits = 2 to 4 and vegetables = 3 to 5 servings per day)

Consume enough fruits and vegetables while staying within energy needs: 2 cups of fruit and 2 1/2 cups of vegetables per day for a reference 2,000 calorie intake. Make adjustments for various calorie levels.

Fat Intake
Keep total fat between 20 percent and 35 percent of calories, with most fats coming from sources of polyunsaturated and monounsaturated fats such as fish, nuts and vegetable oils; limit saturated fats, trans-fats and cholesterol.

Salt Intake
Consume less than 2,300 mg of sodium per day (1 level teaspoon of table salt) and include potassium-rich foods such as fruits and vegetables.

Sugar Intake
Choose and prepare foods low in added sugars or caloric sweeteners.

Dairy Intake
(3 servings per day)
Consume 3 cups per day of fat-free or low-fat milk or equivalent.

Bread, Cereal, Grain Intake
(6-11 servings per day)
Half of one's intake of grains should be in the form of whole grains.

Protein
(2-3 servings per day)
2-3 ounces poultry, fish or lean meat
1 1/2 cup cooked dry beans
1 egg = 1 ounce meat,
4 ounces or 1/2 cup tofu

Physical Activity
Engage in at least 30 minutes of moderate physical activity on most days of the week. To help manage weight, engage in about 60 minutes of moderate to vigorous activity on most days of the week, while not exceeding calorie requirements.

Protein

Protein is important for muscle and bone growth. However, eating extra protein does **not** cause increased muscle growth. Muscles grow only as a result of proper exercise. Foods high in protein include milk, yogurt, meats, fish, chicken, turkey, egg whites, soy, cheese, cottage cheese, beans and nuts. In addition to fish being a good source of protein, the fish oils (fats) are believed to help prevent heart disease (see "Fat" in this chapter). Protein should provide 15-20 percent of the total caloric intake. Protein from animal sources is a **complete** protein. This means it contains all of the essential building blocks of protein called amino acids.

Adults can receive adequate protein eating only a vegetarian diet, but this is more difficult for growing infants and children. Many people do not realize that protein also is available from non-meat sources. Dried beans, legumes, soy, nuts and seeds are fairly good sources of protein.

Most people eat more protein than they need. In a review of three-day diet records from our clinic, the young men were getting approximately three times, and the young women two times the amount of protein needed. High protein intake usually results in high animal fat intake, which may be bad for the heart. It may also provide an extra stress for some people's kidneys.

It is important to choose low-fat meat and poultry. Low-fat meats may be graded as **lean** or **choice** for lower amounts of fat. *Two examples of*

reducing the fat content of the diet are:

1. removing the skin from poultry
2. buying meats which do not have a lot of visible fat

Fat is higher in calories than other foods, which can lead to weight gain. High fat intake also increases the risk for heart disease (this is discussed in more detail below under "Fat"). Most fast-food is high in fat (hamburgers, cheeseburgers, french fries).

Carbohydrate

Carbohydrate is the food source we are most concerned about for people with diabetes. This is because it is the main nutrient that is changed to blood sugar. Carbohydrate is important mainly as an energy source for the body. Each gram of carbohydrate supplies four calories.

It used to be believed that sugar, which is a carbohydrate, was rapidly absorbed while starchy carbohydrates were slowly absorbed. This is an easy concept to explain and to believe, but it is **NOT** true. Research has shown that there is no difference in absorption of a sugar as compared with a starchy carbohydrate. This is because the intestine has such high levels of digestive enzymes that starchy carbohydrate is rapidly broken down to sugar. Thus, **"a carbohydrate is a carbohydrate, is a carbohydrate..."**. They all effect blood sugar levels in a similar way.

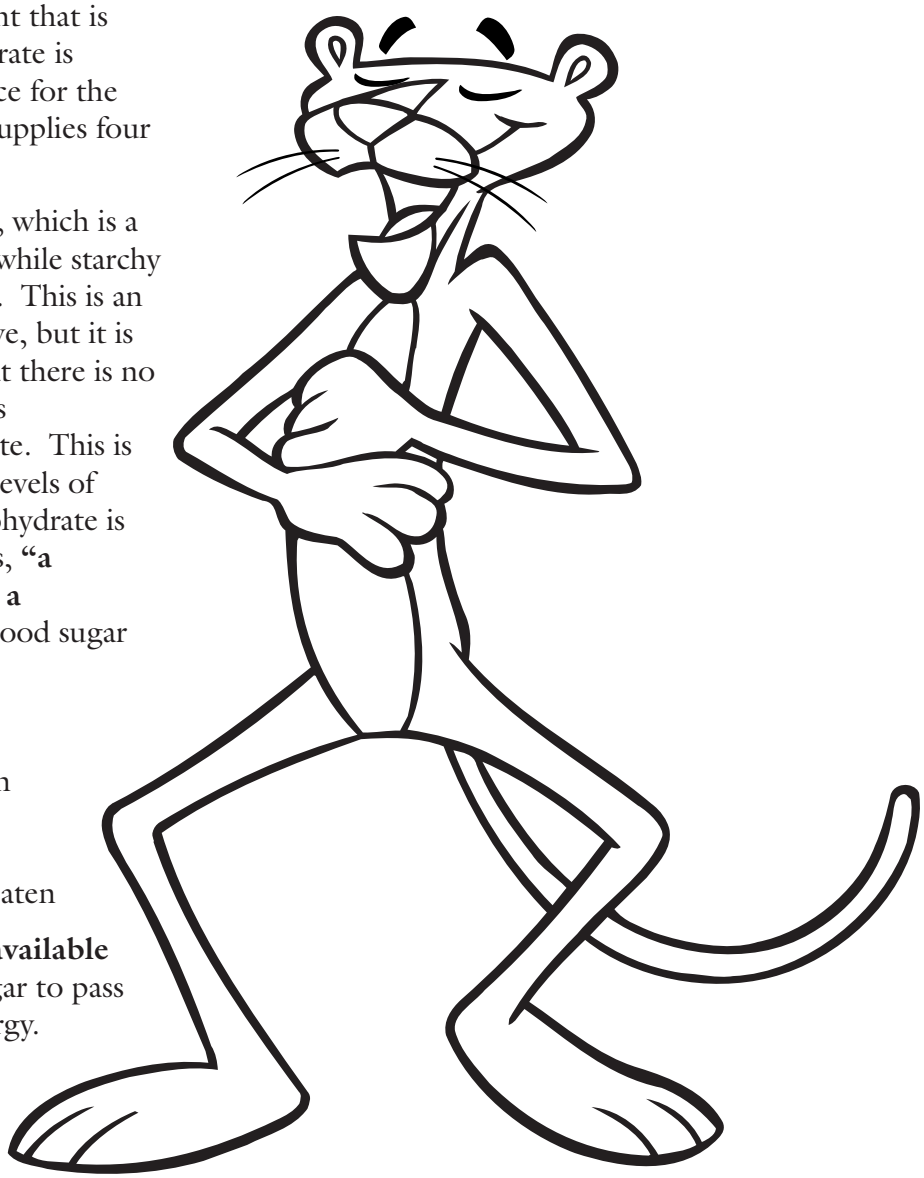
What is important is:

1. **how much** carbohydrate is eaten
2. **when** the carbohydrate is eaten
3. **with what** the carbohydrate is eaten
4. **if adequate insulin activity is available** at that moment to allow the sugar to pass into the cells to be used for energy.

Insulin is essential to allow sugar to pass into the cells of the body to be burned for energy. **The balance between all carbohydrate eaten and the insulin dosage is one of the major keys to diabetes management.** These concepts will be discussed in detail in the next chapter, Food Management and Diabetes. The 2005 Dietary Guidelines for Americans recommends at least 4 1/2 servings of fruits and vegetables per day (for 2,000 calories) and cutting back on foods with added sugar.

Some examples of carbohydrate foods are:

- ✔ breads (encourage whole wheat grain)
- ✔ cereals and grains



- ✔ crackers
- ✔ fruits
- ✔ beans (baked, refried, black, kidney, etc.)
- ✔ vegetables
  - starchy (1/2 cup cooked contains approximately 15g carbohydrate): corn, peas, potatoes and yams
  - non-starchy (1/2 cup cooked contains approximately 5g carbohydrate): green beans, asparagus, broccoli, celery, cabbage, cauliflower and carrots
- ✔ milk and yogurt (contain protein and may also contain fat)
- ✔ most desserts

More detailed knowledge about starches and sugars, both of which are carbohydrates, is helpful.

Starch: Starch is a substance made up of hundreds of sugar units. The sugar from starch is now known to be absorbed as quickly as from table sugar (when each is taken alone without other foods). Sources of starch are breads, noodles, pasta, rice, cereals and starchy vegetables such as corn, peas, potatoes and legumes.

Sugar: The World Health Organization (WHO) recommends that all people should limit (processed) sugar intake to less than 10 percent of calories. A diet high in sugars contributes to dental cavities and provides few vitamins and minerals. Often high sugar foods also contain large amounts of fat. A nutritious diet does not contain large amounts of high sugar foods. There are many different kinds of sugar found in foods. Some sugar is often added to foods as a sweetener and may not be noticed unless labels are read. The names for sugars often end in "—ose." Some of the common sugars are listed below.

- ✔ **Glucose:** Glucose is the name for the main sugar in our body. When we talk about blood and urine sugar, we really mean glucose. Table sugar is half glucose and half fructose. Corn sugar is primarily glucose. Another name for glucose is dextrose.
- ✔ **Fructose:** Fructose is sometimes called "fruit sugar" as it is the main type of sugar found in fruits. It is sold in pure granulated form and is a part of many food products. Fructose has the same number of calories per gram as table sugar (sucrose). The liquid form is sweeter than table sugar, but the taste is the same in baked products. Generally, only one-half to one-third the amount of fructose needs to be used to have the same degree of sweetness as table sugar.

  "High-fructose" corn syrup is different from pure fructose and contains large amounts of sucrose. People with diabetes need to be aware of how much of this is eaten.
- ✔ **Sucrose or table sugar:** The body breaks down sucrose to glucose and fructose. Foods high in sucrose and glucose include cake, cookies, pie, candy, soft drinks and other desserts.
- ✔ **Lactose or milk sugar:** Lactose is found in milk and yogurt. Children and adolescents should drink three to four 8 oz glasses of milk per day for calcium and vitamin D.
- ✔ **Syrups:** Corn syrup, corn syrup solids, high fructose syrups, maple syrup, sorghum syrup and sugar cane syrup are often added to baked goods. They are all primarily glucose and must be consumed carefully by people with diabetes.

Fat

Fat is an important energy source and is needed for growth. The 2005 guidelines recommend that fat should provide only 20-35 percent of total caloric intake. The types of fats found in fish, nuts and vegetable oils are preferred. A major emphasis in nutrition in the past decade has been the reduction of the total daily fat intake and lower dietary cholesterol intake. Dietary cholesterol intake should be < 300 mg/day. People with high LDL cholesterol levels (Table 2) may benefit from lowering dietary cholesterol to < 200 mg/day. Reducing cholesterol and saturated fat intake is

Table 2
Recommended Levels (mg/dl) for Lipids and Lipoproteins

Lipid Type	Desired Level**	Borderline	Abnormal***
Cholesterol	< 170	170-199	> 200
LDL Cholesterol*	< 100	100-130	> 130
HDL Cholesterol*	> 40	35-40	< 35
Triglyceride*	< 150	150-199	> 200

* Preferably drawn after fasting overnight. If fasting overnight is not possible, then at least four hours after eating.
** Desired level for a person with diabetes
*** Abnormal value for anyone, with or without diabetes

discussed as the sixth principle of food management for a person with diabetes in the next chapter. Higher fat and cholesterol intakes may lead to elevated blood fat levels (cholesterol and triglycerides: Table 2) and a higher risk for heart disease. (People may consume as much as 40-50 percent of calories from fat rather than the recommended 20-35 percent.) Fried food eaten in fast-food restaurants is usually very high in fat. Fat has more calories (nine calories per gram) than protein or carbohydrate (four calories per gram). Thus, it is more likely to lead to weight gain and obesity. Most effective long-term weight reduction programs emphasize limiting total fat intake.

The main fats in the diet are divided into four types:

- ✔ **monounsaturated** (high in olive and canola oils)
- ✔ **polyunsaturated** (most vegetable oils)
- ✔ **saturated** (mainly animal fats; e.g., meats, cheese, butter)
- ✔ **trans-fats** (the 2005 guidelines recommend keeping trans-fat intake as low as possible)

It is important to eat more of the monounsaturated and polyunsaturated fats than the saturated fats. **Less than 10 percent of total calories eaten per day should be from saturated fat.** Increasing the intake of monounsaturated fats (e.g., olive oil and canola oil) can help prevent heart disease.

There are high amounts of polyunsaturated fat in most vegetable oils (coconut and palm are exceptions). Margarines made from vegetable oils are also polyunsaturated. In general, the softer or more liquid a fat is at room temperature, the less saturated it is. For example, liquid margarine is a better choice than stick margarine, and vegetable oil is better than vegetable shortening. Stick margarine contains more trans-fats. In general, the harder the margarine, the more trans-fats.

The saturated fats include most animal fats such as the fat in meats, cheese, milk, butter and lard. Chicken, turkey and fish are lower in saturated fat than beef or pork, particularly when the skin is removed. Chicken, turkey and fish also contain some polyunsaturated fat.

Blood Lipids

High levels of the two main blood fats (lipids), **cholesterol** and **triglyceride**, can lead to early aging of the large blood vessels. These vessels carry blood to the heart, legs and other body parts. Other causes of early aging of large blood vessels are diabetes, tobacco use, high blood pressure, lack of exercise and being overweight. As people with diabetes already

Table 3

Making Food Choices for Fat Content

Food Group (Amount)	Decrease	Instead Choose
Meat, Poultry, & Fish (6-8 oz per day)	Beef, pork, lamb, regular ground beef, fatty cuts, spare ribs, organ meats	Lean beef, pork, lamb (lean cuts), well-trimmed before cooking
	Poultry with skin, fried chicken, fried fish, fried shellfish, regular luncheon meat (e.g., bologna, salami, sausage, frankfurters)	Poultry without skin, fish, shellfish, processed meat – prepared, from lean meat (e.g., sliced turkey from the deli)
Eggs (≤ 2 yolks per week)	Egg yolks: If high blood cholesterol, limit to two per week (includes eggs used in cooking and baking)	Egg whites (two whites can be substituted for whole egg in recipes), cholesterol-free egg substitute
Dairy Products (2-3 servings per day)	Whole milk (fluid, evaporated, condensed), 2% fat milk (low-fat milk), imitation milk, whole milk yogurt, whole milk yogurt beverages, regular cheeses (American, Blue, Brie, Cheddar, Colby, Edam, Monterey Jack, whole-milk Mozzarella, Parmesan, Swiss), cream cheese, Neufchatel cheese	Milk – fat-free, 1/2%, or 1% fat (fluid, powdered, evaporated) Yogurt – nonfat or low-fat yogurt or yogurt beverages Cheese – low-fat natural or processed cheese
	Cottage cheese (4% fat)	Low-fat or nonfat varieties of cottage cheese
	Ice cream	Frozen dairy dessert – ice milk, frozen yogurt (low-fat or nonfat), nonfat ice cream
	Cream, half & half, whipped cream, nondairy creamer, sour cream	Low-fat coffee creamer, low-fat or nonfat sour cream
Fats and Oils (≤ 6-8 teaspoons per day)	Coconut oil, palm kernel oil, palm oils	Polyunsaturated oils – safflower, sunflower, corn, canola*, olive*, peanut
	Butter, lard, shortening, bacon fat, hard margarine	Margarine – made from unsaturated oils listed above, light or diet margarine, especially soft or liquid forms (e.g., Parkay Squeeze™)

* High in mono-unsaturated fats.

Adapted from Powers, MA; *"Handbook of Diabetes Medical Nutrition Therapy"*, Aspen Publishers, Inc. Gaithersburg, MD, 1996 p. 354.

have one risk factor (by having diabetes), they do not need another. Research from the Barbara Davis Center has shown that children with poorly controlled diabetes have higher blood cholesterol and triglyceride levels than children who have good diabetes control or who don't have diabetes. In addition to poor diabetes control, eating foods high in total fat, animal (saturated) fat or high in cholesterol often results in higher blood cholesterol levels. The genetics (or family history) also contributes to high cholesterol levels.

In addition to cholesterol levels, the proteins which carry cholesterol in the blood (lipoproteins) are also important. The **LDL cholesterol** (often referred to as the **"bad cholesterol"**) carries the cholesterol into the blood vessel wall. Therefore, this level needs to be low. Some groups are now recommending the value be < 70 rather than < 100 as shown in Table 2. In general, lower is good. The cholesterol build-up in the blood vessel wall may lead to hardening of the arteries (atherosclerosis) which makes a heart attack more likely to occur. The **HDL cholesterol ("good cholesterol")** carries the cholesterol out of the blood vessel wall. This level should be high. Desired levels for people with diabetes are shown in Table 2. Since diabetes alone is a risk factor for heart disease, the desired levels shown in Table 2 are lower for people with diabetes than for the general population.

We recommend a low-fat diet that allows no more than 20 to 35 percent of total calories from fat. Cholesterol intake should be < 300 mg/day. We also recommend limiting intake of foods that are high in animal (saturated) fats and trans-fats. Suggestions for changes are shown in Table 3. Reduction of total fat, animal (saturated) fat and cholesterol intake are good nutrition practices whether a person does or doesn't have diabetes. Trans-fatty acids are similar to saturated fatty acids. They both raise blood cholesterol levels. Hydrogen has been added back to make them less liquid. They are found in solid margarines, commercial cookies, crackers and other foods.

Suggestions for good nutrition include eating:

- fish and poultry (with the skin removed)
- cold-water fish (salmon, light tuna), with omega-3 fatty acids, at least twice weekly
- milk with no more than 1 percent fat
- canola, olive, corn, safflower or soy oils should be used for salads and cooking
- Other suggestions for improving the fat content of food choices are shown in Table 3.

Vitamins and Minerals

These are important for growth, formation of blood cells, healthy skin, good vision, and strong teeth and bones. Fruits and vegetables are rich in vitamins. Vitamins E and C have antioxidant properties that may be important in preventing heart or blood vessel disease. Minerals are found in milk, meats and vegetables. Calcium is a mineral that is important for the bones and teeth. People who do not drink milk or eat dairy products may need to take a calcium supplement. Many foods (e.g., cereals, waffles) are now fortified with calcium. Children ages 1–3 years need 500 mg of calcium per day and those who are 4–10 years need 800 mg of calcium per day. Most people 10-20 years old need 1,300 mg of calcium per day.

Zinc is a mineral that is lost in the urine in proportion to sugar in the urine. Zinc is important for growth. Some children with diabetes may grow better with a zinc supplement.

Sodium is also a mineral, which, in some "salt-sensitive" people, may cause higher blood pressure. It is now recommended that all people limit their sodium to less than 2,300 mg (1 tsp) per day. If the blood pressure is elevated, this amount should be even lower. Salt in the food we eat (e.g., chips, hamburgers, hot dogs and convenience foods) is often "hidden" but may be a significant source of salt.

Generally, people who eat a well-balanced diet do not need extra vitamins. If a child does not eat a balanced diet (e.g., not liking yellow or green vegetables), a vitamin supplement may

be helpful. Also, vitamins and minerals often are recommended in the month following onset of diabetes as the body rebuilds. In general, "mega" doses of nutrients should be avoided, and the vitamins should not contain more than 100 percent of the recommended daily allowance (RDA). The fat-soluble vitamins (A, D, E and K) are stored in the body and excessive doses can be harmful. If you do take vitamins, choose a multi-vitamin with trace minerals that includes zinc and iron.

Water

Water is the most important nutrient for the survival of humans. It makes up much of the blood, the body fluids and the body's transport system. It serves as a coolant, shock absorber and waste remover. It has many other important functions. Since the body is made-up of about two-thirds water, it is important to drink a lot of it. We recommend at least six 8-oz glasses of liquid per day, including allowed sugar-free drinks, juices and milk. When a person with diabetes is spilling urine ketones, it is important to drink more water and sugar-free liquids. This helps to replace body fluid loss.

Fiber

Dietary fiber is the part of plants ("roughage" or "bulk") that is not digested and is not absorbed into the body. Foods vary in the amounts and kinds of fiber they contain. Fiber in the diet supplies bulk (without calories) and roughage which helps satisfy the appetite and keep the digestive system running smoothly. In people with type 2 diabetes, increased fiber intake has been helpful in slowing the absorption of sugar. Fiber has not been as helpful in lowering blood sugar levels in people with type 1 diabetes.

Fiber often is divided into two types. The first is **water-soluble fiber**, such as parts of oats and beans, seeds, citrus fruits and apples. These may help lower the blood cholesterol levels. They also may help reduce the blood sugar levels after meals in people with type 2 diabetes. The other type, **water-insoluble fiber**, such as parts of wheat bran, most grains, nuts and vegetables, helps prevent constipation and may help other digestive disorders. According to the 2005 Dietary Guidelines, the minimum intake of fruits and vegetables is "5-a-Day." The Eat 5-a-Day campaign was developed by The Produce for Better Health Foundation in cooperation with the National Cancer Institute. This includes 2 servings of fruits and 3 of vegetables. The current recommendation is to eat between 20g and 35g of fiber in the daily diet.

An example of fiber in breakfast might be: a serving of a cereal with 2.5g of fiber, two slices of whole wheat bread and a whole banana. The fiber intake would be 8.1g. Most of us need to increase our fiber intake.

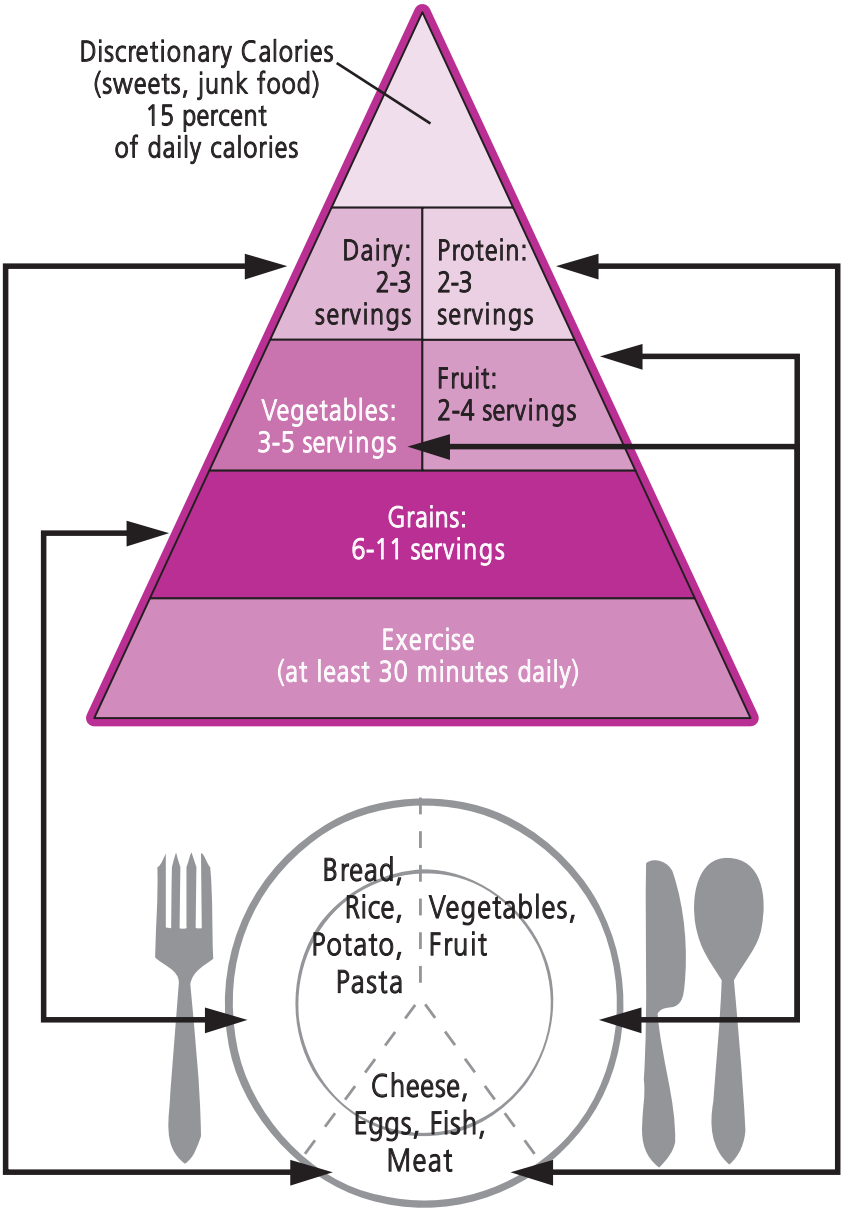
FOOD GROUPS/FOOD GUIDE PYRAMID

Foods are often divided into groups or exchanges (see Chapter 12). The common divisions include the milk and yogurt, meat, grains and starchy vegetables, non-starchy vegetables, fruit, and fat groups. At least one-half of the servings of grains for the day should be whole grain. The milk and meat groups are important sources of protein, and the milk group is a major source of calcium and vitamin D. Milk also has carbohydrate. Some of the minerals such as iron and zinc are high in the meat groups. Vitamins and fiber are generally highest in the fruit and vegetable groups. Be aware that some foods from each of the food groups should be eaten daily to have a well-balanced diet. The food pyramid (see Figure) is now usually used as a guide to good nutrition (rather than food groups).

Three-day Food Record

It is sometimes good to keep a three-day food record. This will show you if you are eating the right foods. Write down all foods and the amounts you eat for three days as shown in the Appendix in this Chapter. The dietitian can then review the record and suggest changes if needed. Chapter 12 emphasizes the use of food records

The Healthy Eating Pyramid

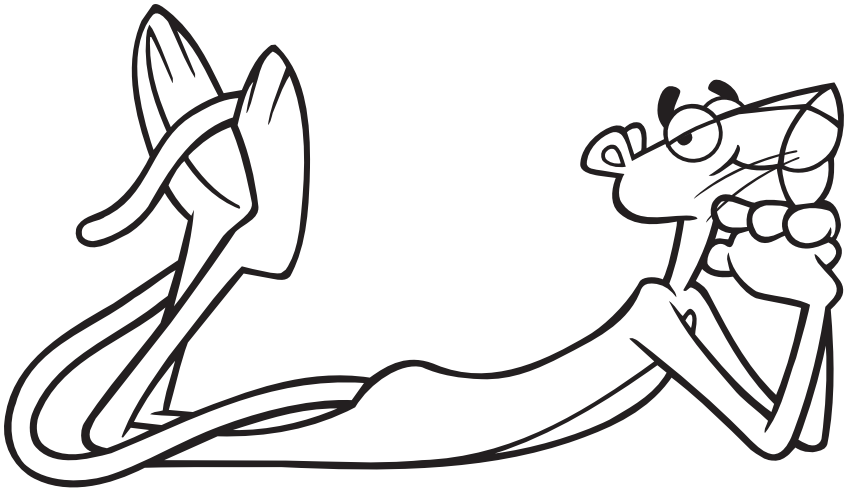


The Daily Plate of Food

What does your plate for a day look like?

Look at the food guide to see if you need to:

- **Eat more starch foods (e.g., whole wheat bread, brown rice, potato and pasta)**
- **Eat more fruits and vegetables**
- **Eat less protein and fat (particularly red meat)**
- **In general eat more foods that are low on the pyramid and fewer foods that are higher**



to evaluate carbohydrate counting. While you are doing the recording, you will need to give accurate information. If you feel you need more help with instructions, ask your dietitian.

SWEETENERS
(Sugar-substitutes)

Many foods are now available which contain sweeteners that either do not raise the blood sugar or which may cause less of an increase than a similar amount of table sugar. They are divided into the nutritive sweeteners (including table sugar), which do provide calories and carbohydrate, and the non-nutritive sweeteners, which essentially provide no calories or carbohydrate.

Nutritive Sweeteners

✔ **Sugars**
These include all sugars and all sugar-alcohols. Sugars contain 4g of carbohydrate and 16 calories per level teaspoon. The two main sugars used as sweeteners are sucrose (table sugar) and fructose. Both are discussed earlier in this chapter under Carbohydrates, and both cause an increase in blood sugar levels. High-fructose corn syrup is a combination of both sugars and raises the blood sugar more than pure fructose. Foods sweetened with fruit juices, dates or raisins may have the label "no added sugar." This is misleading as there is sugar in these food-additives.

✔ **Sugar Alcohols**
The sugar alcohols include sorbitol, xylitol, mannitol and others (often ending in "—ol"). They provide about 2g of carbohydrate and eight calories per teaspoon. They are more slowly absorbed than sugar, and eating an excessive amount can cause diarrhea. They are often found in "sugar-free" candies and cookies as well as other low carb products.

Non-nutritive Sweeteners

The non-nutritive (or "artificial") sweeteners do not provide any calories or carbohydrate. *The six currently on the market are:*

1. **Saccharin:** Saccharin is 200-700 times sweeter than table sugar. It is found in Sweet'N Low®, other table top sweeteners and in some diet drinks.

2. **Aspartame:** Aspartame is 200 times sweeter than table sugar. It is broken down into aspartic acid, methanol and phenylalanine. (Rare patients with a condition called phenylketonuria cannot metabolize phenylalanine and cannot eat foods with this sweetener.) People have suggested that the methanol (or its breakdown product, formaldehyde), could be bad for one's health, but there is **NO SCIENTIFIC DATA TO SUPPORT THIS IN HUMANS.** The products that contain aspartame include: Equal®, NutraSweet®, diet pop, sugar-free JELL-O®, Kool-Aid®, ice cream, Crystal Light® and many others. Use in moderation is generally advised (no more than two diet pops per day!).

3. **Acesulfame-K (Ace-K):** Ace-K is 200 times sweeter than table sugar. It is approved for use as a table-top sweetener (Sweet-One® or Sunnette®) and for use in chewing gum, desserts, beverages and other products. It is used in many sugar-free drinks and in other products along with aspartame.

4. **Sucralose:** Sucralose was approved for use in 1998 and is 600 times sweeter than sugar. It is used as a table-top sweetener (Splenda®) and is found in RC Cola®, in Ocean Spray Lightstyle Juices® and in Log Cabin® Sugar-Free Syrup as well as in many other products.

5. **Stevia:** Stevia is a natural alternative sweetener from the herb, Stevia Rebaudiana. It is 300 times sweeter than sugar. It is not approved by the FDA as it is sold as a food supplement.

6. **Neotame:** Approved by the FDA as a general-purpose sweetener and is 30-40 times sweeter than aspartame. It is not currently found in the market.

Table 4

Reading a Nutrition Label

- The serving size is shown at the top. It is important to observe the serving size. (This is often less than the amount people eat. If you eat two cups rather than one, you would need to double all of the daily values eaten.) The total calories and the calories from fat per serving are routinely given and are important.

- The total fat includes all types of fat (saturated, polyunsaturated and monounsaturated). The total fat, saturated fat and cholesterol content are all important in relation to heart disease and it is wise to look for lower fat choices.

- The saturated fats for the entire day should be under 10 percent of the total calories per day. For someone eating 2,000 calories per day, this would mean under 200 calories from saturated fat or under 22g (nine calories per gram). The trans-fat content appears on the label as of 2006.

- †The percent of daily values for fat, carbohydrate and protein are listed on the label based on a 2,000 calorie daily intake. More active people will need more calories, in which case these amounts should be figured based on calories actually eaten.

Nutrition Facts

Serving Size 1.0 Cup (120g)
Servings Per Container 8

Amount Per Serving

Calories 130 Calories From Fat 60

% Daily Value †

Total Fat 6.5g	10%
Saturated Fat 2.5g	12%
Cholesterol 30mg	10%
Sodium 240mg	10%
Total Carbohydrate 15g	5%
Dietary Fiber 2.5g	10%
Sugars 3g	
Protein 3g	6%
Vitamin A 10%	Vitamin E 5%
Calcium 15%	Iron 5%

†Percent Daily Values are based on a 2,000-calorie diet. Your daily values may be higher or lower depending on your calorie needs:

Calories:	2,000	2,500	3,200
Total Fat (g)	65	80	107
Sat Fat (g)	20	25	36
Cholesterol (mg)	300	300	300
Sodium (mg)	2,400	2,400	2,400
Total Carb (g)	300	375	480
Fiber	25	30	37

Calories per gram:

Fat 9 Carbohydrate 4 Protein 4

Ingredients: Whole wheat, oat bran, raisins, gelatin, malt, flavoring, vitamins, and minerals.

- **For those who count carbohydrates, one helping of this cereal has 15g of carbohydrate, which is one carbohydrate choice (or count).** If one cup of white milk (any type) is added, then one additional carbohydrate choice must also be added so that there would be a total of two carb choices. The sugars include those found naturally in the food as well as those added to the food. Both are included in the grams of "Total Carbohydrate."

- The recommended daily amounts for cholesterol, sodium (salt) and fiber stay the same for the 24-hour period for the three caloric intakes.

- The ingredients below are usually included on the label in order of the amount present.

LABEL READING

Label reading has become easier for people in the U.S. as the law requires labeling of the nutrient content of products. Smart buyers can learn a lot about the foods they are considering buying by learning to read labels. The information that can be gained from reading a label is discussed in Table 4.

If you are interested in the carbohydrate content for carbohydrate (or "carb") counting (see Chapter 12), it is listed under "total carbohydrate" on most labels. In the U.S., one carbohydrate choice is considered to be 15g of carbohydrate. The choices are approximate so that a food having 12g may be rounded off to one choice. For high fiber foods (> 5g), the grams of fiber (which are not absorbed) can be subtracted from the grams of total carbohydrate. Carbohydrate counting is discussed in detail in the next chapter.

FAST-FOOD RESTAURANTS

It is difficult to eat at fast-food restaurants and not eat foods high in animal fat, calories and salt. Eating at fast-food restaurants goes against good nutrition principles and may be unhealthy for the heart. In addition, meals are usually low in vitamin-containing fruits and vegetables. Some fast-food restaurants are now trying to provide healthier food choices (salads, fruit, milk [with meals], leaner meat and deep-frying in vegetable oils rather than animal fat). However, eating at fast-food restaurants should be limited.

ALCOHOL

We hesitate to discuss alcohol under normal nutrition. It is, of course, illegal for children and adolescents to use alcohol prior to reaching the legal drinking age in a particular state or country. We do not condone alcohol use for children or adolescents. However, exposure often begins prior to the legal drinking age. Education is important regardless of the age.

Blood sugars may initially be elevated after drinking alcohol; beer, for example, contains a fair amount of carbohydrate. However, the more dangerous effect of alcohol is the lowering of the blood sugar level (as much as 6-12 hours later). The alcohol prevents the other foods stored in the body from being converted to blood sugar.

If alcohol consumption is to occur, some general rules are listed below:

- ✔ Use alcohol only in moderation. Sip slowly and make one drink last a long time.
- ✔ Eat when drinking alcohol. Never drink on an empty stomach.
- ✔ A low blood sugar is the main worry - and a bedtime snack (solid protein and some carbohydrate) must be taken after drinking in the evening even if the bedtime blood sugar level is high.
- ✔ The next morning, get up at the usual time, test blood sugar, take insulin, eat breakfast and then go back to bed if you feel ill. "Sleeping-in" can result in a bad reaction.
- ✔ NEVER drink and drive. Ask a friend who has not been drinking to drive, or call someone to come and get you.

A college student, helping to teach our College Workshop course to newly-graduated high school seniors, had a useful recommendation regarding college parties. He noted that if he had a cup in his hand, no one tried to push further drinks. In contrast, if his hands were empty (no glass), he received a lot of pressure. The answer was to hold the same cup all evening and to just have fun!

Appendix

Three-Day Food Record Form

Instructions for completing food record form:

1. Please write down everything you eat or drink for three days. This includes meals and snacks. Often it's easier to remember what you eat if you record your food intake at the time you eat it.
2. Include the amount of food or beverage eaten. Also include the method of preparation (baked, fried, broiled, etc.), as well as any brand names of products (labels can also be enclosed). Use standard measuring cups or spoons. Record meat portions in ounces after cooking. If you do not have a scale, you can estimate ounces. The size of a deck of cards is about equal to three ounces of meat.
3. Be sure to include items added to your food. For example, include salad dressing on salad, margarine or butter on bread.
4. Include any supplements you take (vitamin, mineral or protein powders). Write down the name of the supplement, what it contains and the amount taken. Include a copy of the label, if possible.
5. Please include meal and snack times, blood glucose values, amount of insulin, type of food, amount of food, grams of carbohydrate and any activity or exercise. Put a star next to any blood sugar that is two hours after a meal.

The following is an example of how to complete your food record. Please record what you eat on the forms in this chapter. The forms can then be faxed or mailed to your diabetes care provider. *An example for the start of a day follows:*

Time	Blood Glucose	Insulin	Food (include amounts)	Carbs	Activity
8:00	170	4H/10N	Cheerios–1 1/2 cup	34g	
			Fat free milk–1 cup	12g	
			Orange juice–1 cup	30g	
10:00					Jog–20 min.

THREE-DAY FOOD RECORD FORM

Name: _____ Home Phone: _____

Date(s): _____ Work Phone: _____

Dietitian: _____ Best time to be reached: _____

Time	Blood Sugar	Dose: Insulin/ Oral Meds	Food (include amounts)	Carbs	Activity/Other (illness, stress, menses, etc.)

COPY AS NEEDED

DEFINITIONS

Acesulfame-K: An artificial sweetener which does not need insulin to be absorbed by the body. It is available as Sweet-One when used as a sweetener at the table.

Artificial sweetener: A very sweet substance (many hundreds of times sweeter than table sugar) used in very small amounts (and thus having almost no calories) to make foods or drinks taste sweet.

Aspartame: An artificial sweetener which does not need insulin to be absorbed by the body. It is available as a tablet or powder called Equal or NutraSweet.

Calorie: A measurement of the food taken into the body for energy.

Caloric intake: Refers to the energy from foods that are eaten.

Carbohydrate: One of the main energy nutrients. It supplies energy for the body and is further divided into sugars and starches. Carbohydrates are found in all fruits and vegetables, all grain products, dried beans and peas, milk and yogurt. *Carbohydrates include:*

- ✔ **Starch:** Carbohydrates such as starchy vegetables, pasta, whole grain breads and cereals.
- ✔ **Sugar:** Carbohydrates such as table sugar, honey, *the four sugars listed below and others:*

1. **Fructose:** The type of sugar found in fruit.
2. **Glucose:** The main type of sugar found in the blood and urine. It is this sugar that is elevated in people with diabetes. Table sugar is half glucose.
3. **Lactose:** The main sugar found in milk. It needs insulin to be used completely.
4. **Sucrose:** Table sugar or "granulated sugar" – the body breaks it down to glucose and fructose. The glucose needs insulin to be used.

Cholesterol: A fat present in foods from animals. It is also made in our body. Our blood cholesterol level results from our own body's production (≈ 85 percent) and from the animal products we eat (≈ 15 percent). A high blood cholesterol level (> 200 mg/dl) results in a greater risk for heart disease.

Cup (c): A measure of volume of eight ounces or 240cc (ml). Two cups equal one pint. Four cups equal one quart.

Dextrose: Another name for glucose.

Dietetic: This just means that at least one part of the food has been changed (e.g., salt, sugar or fat). It does not necessarily mean the sugar has been removed!

Exchange: Division of foods into six groups. Each exchange within the six groups contains a similar amount of carbohydrate, protein, fat and calories.

Fat: One of the energy nutrients. *Total fat includes:*

- ✔ **Polyunsaturated fat:** Fat found mainly in vegetable oils.
- ✔ **Monounsaturated fat:** It is high in olive and canola oils. When large amounts (3 Tbsp) are consumed each day, blood cholesterol levels will be lower.
- ✔ **Saturated fat:** Fat found mainly in animal foods.
- ✔ **Trans-fatty acids:** The fat formed when vegetable oils are processed and made more solid. They may raise the LDL (bad) cholesterol and lower the HDL (good) cholesterol.

Cholesterol and Triglyceride: Fats present in foods and in our bodies. High cholesterol and triglyceride blood levels for many years are a cause of "clogged" blood vessels and heart attacks.

Fiber: The parts of plants in food that are not absorbed by the body.

Gram (g): A unit of weight in the metric system; 1,000g is equal to 1 kg. There are 448g in one pound and 28g in 1 oz. Carbohydrate, protein and fat in foods are measured as grams. Information can be obtained from label reading.

- ✔ One gram of carbohydrate provides four calories.
- ✔ One gram of protein provides four calories.
- ✔ One gram of fat provides nine calories.

Mannitol: A sugar alcohol that is used in foods to give a sweet taste. It does provide calories, but doesn't increase the blood sugar as much as sucrose. Too much will cause diarrhea or an upset stomach.

Ounce (oz): A unit of weight equivalent to 28g. It is also equal to 30cc (ml) of water.

Protein: One of the energy nutrients. It is found in meat, eggs, fish, milk, yogurt and, in lesser amounts, in vegetables and other non-meat products (e.g., nuts, seeds, beans, etc.).

Registered Dietitian (R.D.): A person trained to help you with your meal planning and nutrition. He/she has a minimum of a four-year college degree in nutrition or a related area, has completed an internship and has passed a national exam.

Saccharin: An artificial sweetener (e.g., Sweet'N Low) which needs no insulin and provides no calories.

Sorbitol: A sugar alcohol that is used in foods to give a sweet taste. It does provide calories, but does not increase the blood sugar as much as sucrose.

Tablespoon (Tbsp): A measure of 3 tsp or 15cc (ml). It is equal to 15g (1/2 oz) of water. There are 16 tablespoons of sugar (sucrose) in one measuring cup.

Teaspoon (tsp): A measure of 5cc (ml). It is also equal to 5g of water.

Questions and Answers from NEWSNOTES

Q **What is fiber and what is its value in the diet?**

A Fiber is generally defined as the part of food that is not broken down by the enzymes in the intestine. In the past 50-100 years, the food industry has moved toward the processing of foods, leaving out the parts our bodies cannot absorb and assuming they were of no value. It was forgotten that man had developed over millions of years eating much fiber in his foods. Then in the 1960s, two British epidemiologists noted that African natives had little or no problem with appendicitis, cancer of the colon, obesity, gallstones, adult diabetes, hemorrhoids, constipation, diverticulitis, gallbladder disease and several other diseases which were fairly common in industrialized countries. They developed the "fiber hypothesis" and gave reasons why each of these diseases could be related to a low fiber intake.

Some of the physiological effects of fiber are to prolong the time it takes food to leave the stomach, to shorten the transit of food through the rest of the intestine, to reduce fat absorption and to increase stool weight and bulk. Pressure in the colon is generally reduced.

The effect of fiber in the diabetic diet primarily relates to the delay in food leaving the stomach. For example, sugar (such as in sugar pop) eaten with a high-fiber food (such as whole wheat bread) might slowly trickle from the stomach for slow absorption with a mild increase in the blood sugar. When the same food (sugar pop) is consumed alone, it all passes immediately into the intestine for immediate absorption. (We measured one boy's blood sugar after consuming sugar pop alone, watching it rise from 250 to 450 mg/dl [13.9 to 25.0 mmol/L] in 30 minutes.)

Although fiber sounds like a blessing for the diabetic diet, it has been more useful in type 2

diabetes than in type 1 diabetes. So many things affect the person with type 1 diabetes, particularly insulin dose and exercise, that altering one part of the diet (fiber) and expecting miraculous changes in diabetes control has not been realistic.

Increasing fiber intake should still be a goal for all children and young adults. The high-fiber foods are mainly vegetables, bran or whole grain cereals, whole wheat or rye bread and fruits. At minimum, according to the 2005 Dietary Guidelines, for a 2,000 calorie diet, a person should eat 2 cups of fruit and 2 1/2 cups of vegetables per day. If, in addition, whole grain breads are eaten (e.g., "whole wheat" and not just "wheat"), fiber intake will likely be fine.

Q **Why do you check the blood cholesterol levels each year on the people seen at the Clinic?**

A Blood cholesterol levels (and when possible, triglyceride and lipoprotein levels) are one of the best predictors of who will have heart problems later in life. When someone with diabetes becomes older, this becomes an important concern. Other big risk factors for coronary artery disease are tobacco use, high blood pressure and high HbA_{1c} levels (poor glycemic control). Needless to say, no one with diabetes should smoke, and blood pressures should be checked at regular clinic visits.

Research from the Clinic was among the first to show that children with diabetes have an increased problem with elevated blood cholesterol levels. When the high levels are found, the first concern always relates to the diabetes control. If the control is poor (high hemoglobin A_{1c} level), the high cholesterol may be secondary to the poor diabetes control. If the diabetes control is good and the blood cholesterol level is still high, the next thing to consider is diet. Although most people immediately think of eggs and cholesterol intake, it is even more important to reduce the animal fat (saturated fat) and to increase the vegetable fats, fowl and fish (sources of polyunsaturated and monounsaturated fats) in the diet than it is to reduce the cholesterol intake. We call the ratio of polyunsaturated to saturated fat intake the P/S ratio. It is also important to reduce total fat intake and possibly to increase the intake of monounsaturated oils.

Q **What does the food label, "low-fat" mean?**

A **"Low-fat"** on a label means that the food has 3g of fat or less. It does not say anything about whether the fat is a "good" fat (e.g., polyunsaturated) or a "bad" fat (e.g., saturated fat, trans-fat). It also does not mean that the amount of fat has been reduced in the food. For example, an apple could be labeled "low-fat" as it has less than 3g of fat normally. In contrast, a food labeled as **"reduced fat"** means that one serving of food contains a 25 percent (or more) reduction of fat compared to the usual form of that food. The carbs and total calories of both food classifications are obviously still important for a person having diabetes.

Diet pop, please!