Lesson 1: Factors that Affect Consumer Choice

What do food producers and grocers have in common? They work together to provide the consumer a wholesome product that is a good value. Because the consumer has the right to accept or reject any food item, producers and grocers must work together to influence consumer choice. This lesson focuses on the factors that affect consumer choice.

Factors Affecting Consumer Choice

There are several factors that play a part in helping the consumer decide what food selections to make. The location in which you live may determine your food supply. Small rural grocers are less likely to carry exotic food items, whereas a large supermarket may carry almost everything. The cost of food obviously is a factor. The time of day in which the consumer is shopping helps make some food choice decisions. A ready-to-eat meal is a priority when the shopper is hungry. The shopper who is planning ahead may select the raw ingredients to make the meal.

The consumer's knowledge and skill help determine what is purchased. A more knowledgeable consumer purchases more balanced and nutritious foods. Energy is the fifth consideration. Not only is the energy to prepare the food a concern but also the amount of energy the shopper has while grocery shopping.

Other people play a big part in the quantity of food purchased. A person's emotions will influence what is purchased. When a certain athlete's picture is on a box, admirers are more likely to purchase it. The first items that are encountered in a grocery store also appeal to the emotions. The tools or equipment the consumer has at home also determine what foods will be purchased. Without a microwave oven, why buy microwavable popcorn?

A person's culture also plays a role in his/her diet. Many consumers buy food that fits their culture. Religion determines some people's diets. No red meat on Fridays during lent, no meat at all, and no pork are all dietary restrictions based on different religious views. Advertising influences consumers to purchase foods. The products found in newspaper advertisements are commonly high volume items. A person's lifestyle greatly affects their selection. High energy diets are necessary for active people. Less active people require fewer calories. Finally, a person's values influence selection. The growing segment of the population who avoid alcohol and the shopper who compares different package sizes of the same products are all basing their decisions on their value systems.

Sensory Attributes

Why is parsley used to decorate a steak meal? Because people are drawn to attractive food. The color of a food and/or its packaging helps sell that product. Eyes are also drawn to what they perceive to be ideal sizes and shapes of food, or whose picture is on the package. Processors take advantage of the sense of eyesight.

The second sensory attribute that is used to make sales is the smell or odor of a product. Can you imagine walking past a bakery that is emitting the delicious aroma of fresh baked bread? How would the popular hickory smoke BBQ influence a customer's buying habits?

The third sensory attribute of food is the sense of taste. Different tastes satisfy different taste buds. Foods are made sweet, sour, salty, or bitter to satisfy the specific taste desired.

The texture or feel of a product may also influence purchase decisions. Soft bread, crisp celery, and firm apples are considered desirable texture characteristics by most consumers.

Convenience Affects Selection

Most people do not enjoy washing dishes. This seems to be one of the reasons why people buy convenience foods. Time, energy, clean-up, variety, and equipment all influence consumers to purchase convenience foods. Today, many people are rushed for time. Convenience foods are easy to prepare. It takes energy to plan a meal, shop for it, and prepare it. Convenience foods save most of the energy required to make a meal from scratch. There is little clean-up with convenience food. Variety may induce a consumer to choose convenience. Food leftovers, especially for single-person households, may be the main course too often. Fast food businesses and other restaurants can provide a person with variety. Also, it may take special equipment to prepare foods such as deep-fry or grilled foods. Many convenience-food businesses already have these tools. These five reasons help explain why convenience food is steadily growing.

Not every shopper is a convenience food fan, however. Consumers who believe that slower food preparation or only using fresh or home-grown produce is more nutritious, may be negatively influenced by convenience food advertisements. Another reason why fast foods are not purchased may be because of their high cost relative to a home-cooked meal. If the home-cooked meal is entirely consumed, without spoilage, it is normally cheaper to prepare the meal in the home. Also convenience foods may have more packaging which results in increased disposal costs.

Price's Influence

Price has always been a deciding factor for consumer food selection. Many grocers stock two or more brands of each food type to offer shoppers a variety of brands at a variety of prices. Smart shoppers are careful to examine not only the cost of a food product, but also its nutritional content. Impulse buyers are less likely to be influenced by price.

Packaging's Influence

Food processors have studied consumers' buying habits and realize that packaging definitely affects consumer choice. Labeling claims, "environmentally-friendly," size, and the cost of packaging are four factors that need to be examined.

Current trends reveal that foods low in fat or calories are usually packaged with a label proclaiming in bold letters "fat free" or "just 1 calorie." The Nutrition Facts Panel list is another catchy design, not to mention a star athlete's picture or "free offer inside" approaches. Environmentally-friendly packaging frequently influences consumers. If recyclable paper or biodegradable plastics are used, stewardship-minded consumers will respond positively.

Thirdly, the size of the package can exert an influence. Those family-size packages are great for families, while single-person households shop for smaller packages. Lastly, the cost of packaging plays a part. Current statistics indicate that up to one-third of a food product's cost comes from its packaging. For example, fruits and vegetables sold in bulk with the shopper doing the packaging are cost-savers. On the other hand, resealable lunch meat packages cost more but help maintain freshness. Different packages are beneficial in different situations.

Shelf Life

In general, the longer the shelf life of a product, the more flexibility the grocer and consumer has. Dairy products that spoil within a week are a high risk item to carry. In general, consumers desire fresh foods. Shelf life is extended with frozen, canned, cured, and dried foods.

Safety Concerns

To describe the average consumer's approach to food safety would be a difficult task, for there is a wide spectrum of concern. Most shoppers, when asked, would voice concern over the safety of the food supply. However, when observing consumer's habits, a slightly different picture is painted. More and more people rely on other people to prepare their meals with little knowledge of the cleanliness of the restaurant's kitchen. Safety-conscious shoppers are a growing rank. They can be found carefully

examining produce for blemishes, canned goods for dents, and packaged foods for broken seals.

Nutritional Concerns

"You are what you eat" is a popular saying. Nutritious, wholesome food is the goal of most consumers and producers. Today's smart consumers are probably more nutrition-minded than ever before. Fat content, calories, additives, minerals, vitamins, fiber, and cholesterol are factors related to food quality. Skilled consumers select foods that combine the necessary elements in the right balance to provide for healthy living.

Summary

Choosing wholesome food that will provide a balanced diet is an important task. Consumers are influenced by a variety of factors in their attempt to reach this goal. Factors such as location, time, energy, cost, skill level, advertising, values, and emotions are just a few of the influences on consumer choice. The sense of sight, smell, and touch play a role in selection also. Convenience foods offer an alternative that, depending on your perspective, is a positive or negative influence. Most consumers are price conscious as well as skilled in package selection. Shelf life is directly proportional to value. Safety concerns are slowly growing and are usually voiced when questioned. Likewise, nutritional concerns are in the forefront and heavily influence the labeling of food items.

Credits

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Lesson 2: Interpreting the Food Label

You may be familiar with the old saying: You can't judge a book by its cover. However, for a food product, the cover says a lot. By careful analysis of the food label, you can get information about what is inside, how much is there, what ingredients were used to make the product, and finally how nutritious the product will be to eat.

Many people believe that information on the food label is false and misleading. If the information is false or misleading, then officials from the Food and Drug Administration and the Federal Trade Commission would put the food scientists in jail for mislabeling the product. The food labeling law requires that everything on the label be the truth. However, a discerning consumer can spot efforts at misdirection and confusion on some food labels.

In 1990, Congress passed the most comprehensive food labeling law in the world. This law is known as the Nutritional Labeling and Education Act of 1990. Included in this law were changes in many elements of a food label. These changes were designed to assure that the consumer would have access to accurate, easily understood information. Hopefully consumers will use this information to improve their eating habits. This in turn should improve health, reducing costs paid to physicians and hospitals to take care of people who did not eat correctly.

Parts of the Food Label

A food label is divided into two parts. The largest part, at least 40% of the total package area is known as the principal display panel (PDP). This is the part of the label that the consumer is most likely to see when the package is placed on the grocery store shelf. Thus, it may be the top of an ice-cream carton, or the large side panel of a box of cereal. The PDP must contain information to identify the food, either by a real name (*e.g.,* green beans) or a made-up name (*e.g.,* Cherrios). If a picture appears, it must look like the food in the box. Sometimes, if the food will require cooking before eating, the picture may say "serving suggestion." This says that it requires some additional work to get the product to look like it does on the package. The PDP must also state how much of the product is in the container, usually reported as net weight. The net weight is the weight of the food in the container, minus any liquid or other component that would not normally be consumed. The net weight must be reported in avoirdupois (ounces, pounds, and gallons) and metric (grams and milliliters) units.

The second part of the food label is the information panel (IP). The IP is the part of the label that is immediately to the right of the PDP. There are three elements that must appear on the IP. These include the name and address of the manufacturer, a list of ingredients, and a nutrition facts panel. The address must be present so that a consumer could get additional information about the product, or complain if they wanted to. The

list of ingredients must be in order by descending weight. That is, the ingredient present in the greatest amount appears first, then the next greatest amount and so on until all ingredients are listed. There have been many changes in the ingredient listing so that consumers can know what they are eating. The original source of ingredients is sometimes listed, such as "animal fat" or "protein from soybeans." This allows consumers to avoid animal products for religious reasons or soybeans because of allergic reactions for example. They can carefully read the ingredient statement and discover what raw products were used in the food. Artificial ingredients are identified as such in the ingredient listing.

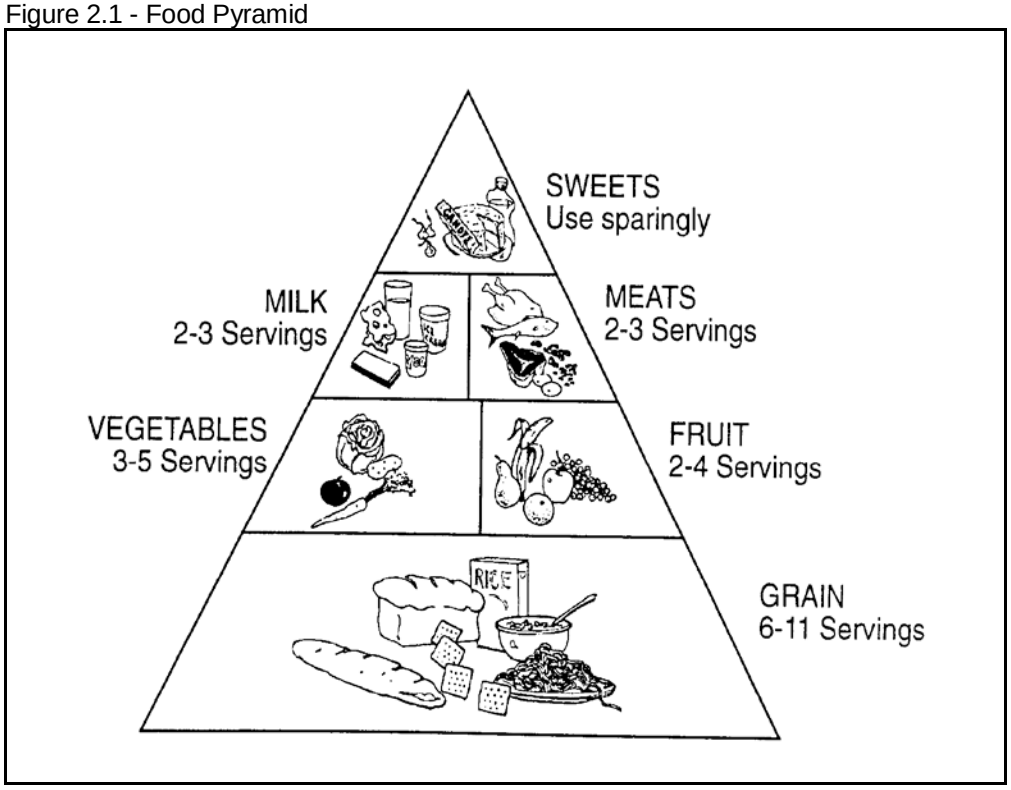
Finally there is the nutritional facts panel. In a very few instances, the nutrition facts panel may be omitted, but all of the other elements must appear on every food product offered for sale to the public. To understand the nutritional facts panel, we must understand something about the way nutrition information is being made available to the average consumer.

Daily Dietary Requirements

While some people may say they live to eat, in reality all people eat to live. Our body cells need a constant supply of many different elements to use as building blocks. Sometimes, these cells need entire molecules to do their functions. These elements and molecules are supplied by the food eaten. Since most people do not want to do a complete chemical analysis before every meal, nutritionists usually talk about food groups and serving sizes. These are easily estimated by most people. Correctly understanding the food groups will be helpful in planning a healthy diet. Nutritionists and other scientists working for the USDA have classified foods into six groups. Five of the groups are: 1) bread, cereal, rice and pasta; 2) fruits; 3) vegetables; 4) meat, poultry, fish, dry beans, eggs and nuts; 5) milk, yogurt and cheese. The sixth group is called the fats, oils, and sweets. This group of food products provides few of the building blocks necessary for proper function of the body, so it is not generally considered a food group. To maintain optimal health, it is necessary to eat some of all of the five food groups each day. But how much?

To help organize these groups in your mind, the USDA has developed a food pyramid (Figure 2.1). The size of each food group block in the pyramid represents how much of each group you should eat each day. For example, the bread group is the largest block, and is located on the bottom of the pyramid. The bread, cereal, rice, and pasta group of foods should serve as the foundation of your diet. Depending on several factors, including your age, sex, and weight, you should eat between 6 and 11 servings of these foods each day. While there are some exceptions, a serving of a food is generally about one-half cup. The foods in the bread group provide the carbohydrates needed for energy, many water-soluble vitamins, and trace minerals needed for proper cell function.

Figure 2.1 - Food Pyramid



The fruit group and the vegetable group provide many vitamins that the body needs. The milk group provides calcium, vitamins and protein, while the meat, poultry, dry beans, eggs and nuts group provides protein and some vitamins. By combining foods from all these groups every day, you will be more assured of eating a healthy diet.

Nutrition Facts Panel

Many people eat foods in which the food groups are combined. Consider a pizza. It contains food from the bread, vegetable, milk, and meat groups (sometimes even the fruit group!) How many servings of each are in a slice? This is why the food label contains specific information on individual nutrients important in the American diet. To make things simpler, the nutrient content of foods is reported in both grams and Percent Daily Value. The Nutrition Facts panel includes total calories, calories from fat, total fat, saturated fat, cholesterol, sodium, total carbohydrate, dietary fiber, sugars, protein, vitamin A, vitamin C, calcium, and iron. (Figure 2.2)

The Percent Daily Value assumes a 2000 calorie per day diet. This is the average calorie needs for most American women. (Men usually need about 500 calories more per day to maintain their weight.) Not all nutrients have to appear on a nutritional label. To keep the label simple, only nutrients known to be a problem for Americans are required to appear on the food label. In the American diet there are some nutrients that people should be sure to eat, such as carbohydrates, dietary fiber, and some vitamins and minerals. There are other nutrients that are important, but it is so easy to get enough of these that they are not included on the label. Unfortunately, there are some nutrients that Americans eat too much of, such as fat, cholesterol, and sodium. The amount of each nutrient in a specific food is calculated as a percentage of the total amount of that nutrient that should be consumed each day. By keeping track of the percentage of each nutrient consumed, when 100 percent is reached, you will know that you have gotten enough (of things like carbohydrates, dietary fiber, and vitamin C) or that you should not eat any more (fat, cholesterol, or sodium).

Figure 2.2 - Nutrition Facts Panel for Thick Crust Pizza

Nutrition Facts

Serving Size 1/2 of 10" pie (208 g)
Servings Per Container 2

Amount Per Serving

Calories 480	Calories from Fat 90
	% Daily Value*
Total Fat 10g	**15%**
Saturated Fat 4.5g	**22%**
Cholesterol 25mg	**9%**
Sodium 1100mg	**46%**
Total Carbohydrate 76g	**25%**
Dietary Fiber 4g	**15%**
Sugars 10g	
Protein 24g	

Vitamin A 20% • Vitamin C 6%
Calcium 35% • Iron 15%

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

	Calories:	2,000	2,500
Total Fat	Less than	65 g	80 g
Sat Fat	Less than	20 g	25 g
Cholesterol	Less than	300 mg	300 mg
Sodium	Less than	2,400 mg	2,400 mg
Total Carbohydrate		300 g	375 g
Dietary Fiber		25 g	30 g

Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

You may wonder why the daily value for protein does not appear on some labels. The first reason is that proteins have different quality. Foods like meat, eggs, and milk have very high quality protein, while other products like gelatin are very low quality. Other foods like grains, need to be combined with legumes (dry beans) in order for the protein to be of high quality. This would be very difficult to express on the food label. Since protein amount and quality is not a problem for most Americans, the daily value is not required. When you see a daily value for protein on a label, the value is adjusted for the protein quality.

The serving size on a food label is determined by comparison to a standard serving size. Serving sizes were found in a US government survey by interviewing thousands of people all over the United States. This is not necessarily the same serving size that is

used on the Food Pyramid, but it is based on real amounts of food consumed at one meal by many Americans. The actual serving size on a label must compare to the standard serving size, the size of the package, and the weight of the food itself. It is a complicated process, but it is designed to make it easier to compare similar foods while shopping.

Unless you have an identical twin, there is no one else in the world exactly like you. Just as people look different, their nutritional requirements are different. It would be impossible to put all of the information necessary to figure out one's exact nutritional needs on every food label, so the information there is only an average for all Americans.

If a person wants to be more specific, he/she can use the information about the grams of each nutrient to calculate specific nutritional requirements. The information necessary to do this is included in the bottom portion of the food label, called the footnote section (see Figure 2.2). Additional information on the changing nutritional requirements for different ages can be found in almost any textbook on nutrition.

Most people are better nutritionists than they might think. As long as people eat a broad variety of foods, in moderation, the body does a good job of selecting what it needs, and disposing of the rest. Nutritional health is decided in the average over a long time, not just what you eat each day. For example, if you "pig out" on a high fat pizza today and get 200 percent of Daily Value for saturated fat you may think your diet is ruined. By limiting your intake of saturated fat from other foods over the next few weeks, there will be no harm done. However, if you consume 200 percent of the Daily Value every day for several months, you probably will find that you have gained a few unwanted pounds and may be at greater risk for heart disease and cancer in the future.

Nutrition, like most sciences, changes almost daily. At universities and research institutes all over the world, scientists are struggling to understand the role of food in health and disease. This means that nutritional recommendations may change as new evidence is uncovered. The food pyramid and the food label reflect the knowledge gained over the past 100 years, and are unlikely to change dramatically in your lifetime. But you never know.

Nutrient Level and Health Claims

Until 1990, words like "lite," "high," "low," and "good source "of" on a food label were hard to understand. There were no standards so food companies could use anything they wanted. Now these words, known as nutrient content claims, are defined by comparison to the Percent Daily Value. Foods that are "good sources" of a nutrient must contain at least 10% of the Daily Value for a nutrient per serving. Foods that are "high" must contain at least 20% per serving. There are similar rules for other descriptors such as lite, low, and free.

Usually foods that contain high levels of fat, sodium, or cholesterol may not claim to be a good source of some other nutrient. It is very complicated for a food company to be sure they can make a nutrition level claim. However, specific rules for using nutrient content claims assures the consumer the claim is meaningful in a real diet.

Some food labels will have health claims. These are sentences that remind the consumer that certain nutrients affect the development of specific diseases. The claims are monitored by government scientists. They must be true and they must be related to some disease that is important to Americans. There are currently (1994) seven different types of health claims allowed:

- high calcium levels may prevent osteoporosis (a loss of calcium from bones)
- low sodium levels may reduce high blood pressure
- low fat levels may decrease problems with cardiovascular disease
- low fat levels may reduce the risks of some types of cancer
- high levels of dietary fiber may reduce the risks of some types of cancer
- high levels of dietary fiber may decrease problems with cardiovascular disease
- high levels of folic acid may reduce risks of some types of birth defects (neural tube defects)

Foods that make health claims must be "high" (calcium, fiber or folic acid) or "low" (fat, sodium) in the specific nutrient. In addition, the levels of other nutrients in the food are considered. For example, whole milk is high in calcium, but it is also a significant source of fat and cholesterol, so it cannot make a health claim. Skim milk on the other hand, may make calcium and fat claims. Again, the rules are complicated, but they assure the consumer that the food making a health claim really is part of a healthy diet.

Summary

The food label is designed to communicate to the consumer. There are four required parts of the food label: 1) the name of the food; 2) the amount of the food in the container; 3) the name of the manufacturer; 4) the ingredient list. Almost all foods also require a Nutrition Facts Panel. Some foods may also have nutrient content or health claims. These parts of the food label are carefully controlled.
Nutritional requirements are illustrated by the Food Pyramid. This graphic representation of the five food groups is very helpful in choosing an adequate diet. However, more complex foods that contain many food groups are difficult to place on the Pyramid. The food label reports a Percent Daily Value that is very helpful.

Proper nutrition depends on the individual. Specific recommendations can be found by combining information from several sources including the food label. Fortunately, by using variety and moderation in food choices, most people do not have to become professional nutritionists to eat a balanced diet.

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Lesson 3: Nutritional Value of Beverages

Have you ever heard of "empty calories." These are foods or drinks that provide calories in your diet but supply very few or no nutrients. Yet many beverages do supply nutrients, as this lesson will explain.

Nutritional Benefits of Beverages

Beverages are an important part of the human diet. The most important function of a beverage is to supply necessary fluids for the body. Depending on the specific beverage, some supply carbohydrates, protein, fat, vitamins, and or minerals. Also, beverages supply the fluid necessary for normal metabolism.

How the Body Utilizes Beverages

Since the human body is 60 percent water, water is very important in the diet and to a person's health. Dehydration symptoms appear when a 5-10 percent reduction in the water balance occurs, accompanied by thirst, weakness, and mental confusion. Water has four major functions in the body: a medium for carrying nutrients within body fluids; a solvent for organic and inorganic chemicals necessary for life, and a medium for which the chemical reactions can be dispersed in; a carrier for the nitrogenous wastes generated by cellular metabolism; and as a control and maintainer of body temperature.

Of course the body will utilize the other nutrients that may be found in the beverage similarly to how it utilizes nutrients found in food. Generally, nutrients are absorbed through the intestinal wall into the bloodstream, with the exception of molecules of aspirin and alcohol which are absorbed through the stomach wall.

Alcohol is metabolized differently than most nutrients. It is absorbed in the stomach where it goes directly to the liver. Alcohol is broken down to its components and used like other nutrients. However, too much alcohol can overwork the liver, causing it to incompletely break down other nutrients. An overworked liver will convert other components to fat. This fat deposits in the liver, causing many other problems. Ultimately, the liver can stop functioning properly. This disease, called cirrhosis, is one of the top ten causes of death in the U.S.

Nutritional Qualities of Common Beverages

Milk is very nutritious as it supplies protein, carbohydrates, fat, vitamins, minerals, and water.

Carbonated soft drinks, the leading beverage in terms of consumption, provide water and carbohydrates. Some provide minerals, like sodium. Others contain fruit juice, which supplies some vitamins. In general, carbonated beverages contribute very few nutrients and should be consumed in moderation. Excessive consumption of these beverages may interfere with the body's ability to absorb calcium.

Coffee and tea, unless they include cream or sugar, supply no nutrients except water.

Fruit juices provide water, carbohydrates, vitamins, and minerals. Some may provide small amounts of protein.

Nature's Almost Perfect Food

Why is milk called nature's most nearly perfect food? It is nature's most perfect food because it is naturally in a liquid state and is easily consumed by young and old alike. Milk protein is of premium quality, including all essential amino acids. The nutritive value of vegetable proteins are substantially increased when milk is consumed with them. The two primary proteins in milk are casein and lactalbumin.

Lactose is the principal carbohydrate found in milk. Milk is the only significant source of lactose in nature. Lactose may have a special role in the growth and development of the central nervous system. Lactose stimulates the growth of microorganisms in the intestine, which produce organic acids and synthesize many B-complex vitamins. Lactose enhances absorption of calcium, phosphorus, and magnesium in the intestine.

Milk fat contains a relatively high amount of short-chain fatty acids, which are easily digested by humans. Some nutritionists believe these short chain fatty acids do not contribute to heart disease like the longer chain saturated fatty acids found in other animal fats. Milk also contains unsaturated, essential fatty acids.

The major minerals found in milk include calcium, phosphorus, potassium, chlorine, sodium, sulfur, and magnesium. Milk is not a very good source of iron or copper in the diet.

Milk contains all known vitamins and is an especially good source of riboflavin and other B vitamins. Vitamins A and D are usually added to milk as a supplement. Vitamin C, ascorbic acid, is the only vitamin needed for good health that milk cannot completely satisfy.

Milk is not a particularly good source of vitamin C, principally because it is pasteurized to prevent the spread of disease causing microorganisms.

Summary

Beverages play a vital role in the diet. Water balance is maintained in the body by consuming water and other beverages.

Body fluid is a medium for carrying nutrients, a solvent for organic and inorganic chemicals, a carrier of waste products, and a control for body temperature. Common beverages provide carbohydrates, protein, fat, minerals, and vitamins depending on the particular beverage. Milk is considered nature's most nearly perfect food. It contains most of the necessary nutrients in high quality form.

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Lesson 4: Relationship Between Diet and Health

Food labels are highlighted with eye-catching slogans such as: "contains no cholesterol" or "high fiber" or "fat-free." Do these influence you? Are you conscious about your diet? Whether you are or are not, you can be sure that your diet does influence your health. This lesson highlights a few of today's issues.

Cholesterol

Cholesterol is a popular topic of conversation. Do you know what it really is? How does it work? Is it true that the body actually makes cholesterol? What are HDL and LDL?

Cholesterol is a waxy, fat-like substance necessary for building membranes, particularly in the brain and nervous system. Cholesterol plays a vital role in bile synthesis and in the production of adrenal and sex hormones. A derivative of cholesterol found in the skin is converted by sunlight to vitamin D. If insufficient amounts of cholesterol are in a person's diet, the liver will produce cholesterol.

Cholesterol found in the blood is called serum cholesterol, or blood cholesterol. Dietary cholesterol is present in foods. Cholesterol is only found in foods of animal origin, like eggs, meat, fish, poultry and cheese. Dietary cholesterol is spread throughout the food, it is not isolated in the skin or fat portions.

Blood cholesterol levels are affected by many factors including diet, heredity, age, and gender. Blood cholesterol levels are measured in milligrams per deciliter. Standards are set as: less than 200 mg/dl - desirable; 200-239 mg/dl - borderline; greater than 240 mg/dl - high. A high blood cholesterol level is a major risk factor for a person developing coronary heart disease. Cholesterol is carried in the blood by molecules called lipoproteins. Low-Density Lipoprotein (LDL) is referred to as "bad" cholesterol because it carries cholesterol to the tissues. High-Density Lipoprotein (HDL) is referred to as "good" cholesterol because it is transported from the tissues to the liver for elimination.

Cholesterol is often discussed in connection with dietary fat, even though they are two different substances. A diet that is high in total fats and saturated fats will tend to increase blood cholesterol levels. The connection between dietary cholesterol and blood cholesterol levels is less certain. This area of nutrition is changing rapidly as we learn more about the role of diet in health.

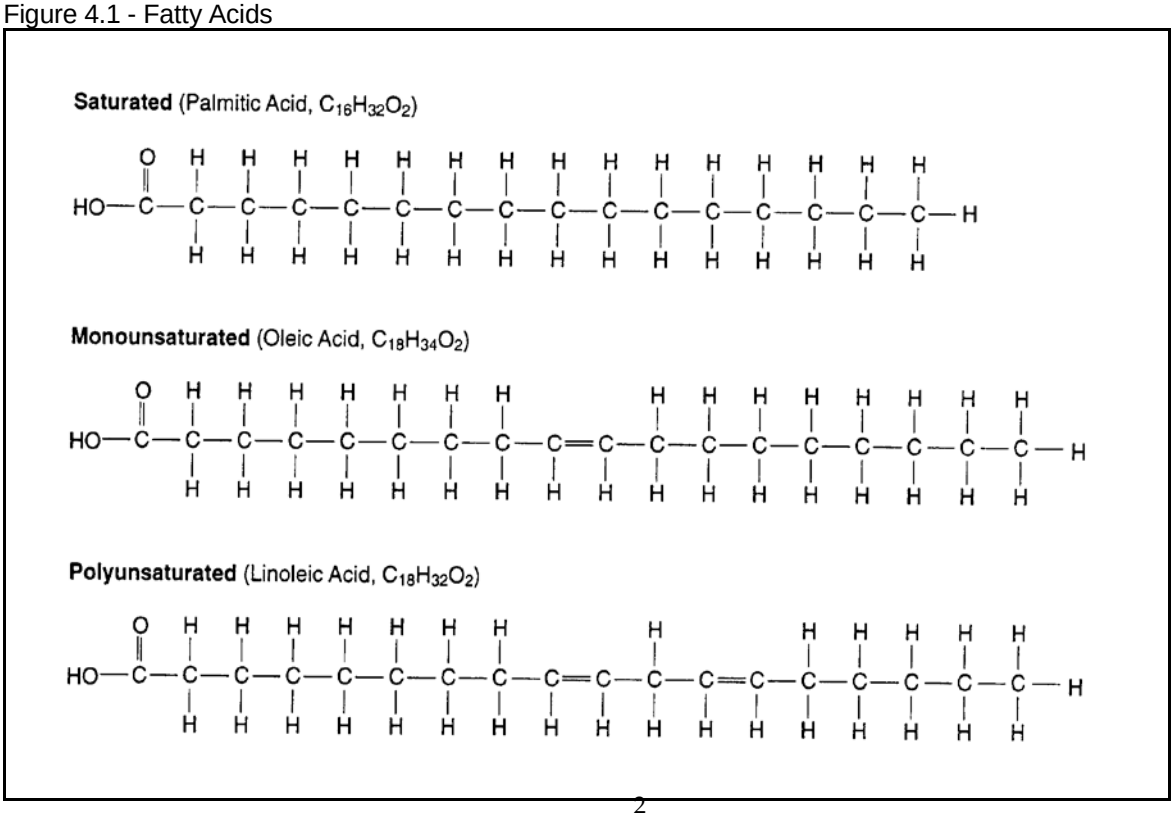
Fats

Fats in food are responsible for many of the flavors, textures, and aromas we find desirable. Fat also influences the degree of fullness and satisfaction (satiety) of a meal. Fats are the most concentrated source of food energy, supplying nine Calories per gram. They are needed to transport and absorb the fat-soluble vitamins: A, D, E, and K.

Fats are composed of fatty acids, which can be classified as saturated, monounsaturated, or polyunsaturated. Three fatty acids attached to a glycerol molecule constitute a triglyceride. Most triglycerides have a chemical structure composed of a long, straight chain of carbon atoms (Figure 4.1). If the carbon atoms are linked together by single bonds, the molecule is a saturated fatty acid. If one double bond connecting carbon atoms is present, it is a monounsaturated fatty acid. If two or more double bonds are present, the fatty acid is polyunsaturated. Their chemical structure determines their behavior in your digestive system and in your body cells.

Saturated fatty acids predominantly come from animal sources and coconut, palm, palm kernel, and vegetable oils. Bear in mind that fats and oils contain many types of fatty acids. They are classified according to their predominant acid type. Because

Figure 4.1 - Fatty Acids



saturated fatty acids can raise blood cholesterol levels, it is recommended that they compose 1/3 or less of total fat intake.

Monounsaturated fatty acids are found in animal and plant fats, especially in olive, canola, and peanut oils. These may help lower blood cholesterol levels. Recommendations call for 1/3 or less of total fat intake to be supplied by monounsaturated fatty acids.

Polyunsaturated fatty acids come from sunflower, safflower, corn, sesame, and soybean oils. These can help lower blood cholesterol. Linoleic acid, which is one example of a polyunsaturated fatty acid, is an essential fatty acid needed for normal growth.

The proportion of saturated to unsaturated fatty acids give fats and oils their individual physical properties. Fats containing more saturated than unsaturated fatty acids are typically solid at room temperature. Fats which are more unsaturated than saturated are typically liquid at room temperature. The exceptions are the mostly saturated palm and coconut oils which are liquids at room temperature.

It is recommended that fats should contribute no more than 30 percent of total calories in your diet.

Fiber and Health

It has long been recognized that fiber contributes to a healthy intestine. Cellulose, pectins, lignin, and other plant substances that are not readily digested, constitute fiber. Fiber holds water, loosens the stool, and decreases the stool transit time through the large intestine.

Research also has shown that adequate dietary fiber may lower serum cholesterol, decrease the incidence of colon cancer, and lower the insulin requirements of diabetics. Fiber from different sources varies in its proportion of the different indigestible components and is not equal in its physiological effect. Grinding and other processes also influence fiber's effectiveness. Excessive fiber may bind minerals and make them unavailable for absorption.

Health Issues and Nutrition

One of the privileges of living in America is the vast supply of high quality, low-cost foods. Americans have a longer life expectancy than many other countries. One of the reasons for this is the availability of good nutritious foods. However, the availability of low fiber, high fat foods contributes to poor health among Americans. Most nutritional diseases in the United States are diseases of excess, but nutritional deficiencies do occur. Many health issues are tied to nutrition.

Anorexia is a disease where the individual refuses to eat, even though they are starving.

Bulimia is a disease characterized by a person vomiting food before it provides nourishment. Bulimia results in starvation and other physiological complications.

Diverticulitis is the condition of an inflamed colon, which can be initiated by certain foods as well as being treated with fibrous foods.

Heart disease is characterized by problems associated with blood circulation. Consumption of high levels of fat seem to increase the risk of developing this problem.

Malnourishment is defined as the lack of, or an insufficient amount of an essential nutrient. There are several diseases caused from malnourishment. Most vitamins and minerals are associated with some nutritional deficiency.

Obesity is almost the opposite of starvation. Obesity occurs when more calories are ingested than spent. An accumulation of calories leads to fat deposits and extra weight. Obesity is a contributing factor to many other diseases including heart disease, arthritis, and diabetes.

Starvation is a condition of being without food for an extended period of time. The body's energy stores are also depleted and the body begins to break down in an attempt to supply energy to the brain, heart, and lungs.

Ulcers are lesions in the stomach lining. Ulcers can be caused by specific foods and treated by specific foods.

Beri-beri is a thiamin deficiency. Osteoporosis is a softening of the bone tissue linked to a calcium deficiency. Night blindness is a vitamin A (carotene) deficiency. Neuritis is a thiamin deficiency. Photophobia is caused by a riboflavin shortage. Anemia is caused by a lack of iron or vitamin B_{12}. Pellagra is caused by a lack of niacin. Scurvy is caused by a shortage of vitamin C. Rickets is a defective bone formation caused by a vitamin D deficiency. And hemophilia is caused by a vitamin K shortage.

A final health-related issue affected by nutrition is a person's recovery time following an illness or surgery. People in good health, who have a balanced diet and lifestyle, require less recovery time.

Health Problems Can be Minimized by Nutrition

The human body is an intricate creation. Its physiological functions depend on hundreds of factors. One of the most important factors is proper nutrition. A balanced diet accompanied by sufficient regular exercise is a great start. Eating habits that follow

the Recommended Dietary Allowance (RDA's) and are appropriate in caloric intake in order to remain in weight range for age and height are highly encouraged. And finally, if diet modification is recommended to correct or prevent a health problem, following a doctor's or dietician's suggestions is recommended.

Summary

There is a direct relationship between diet and health. Issues about cholesterol, fat composition, grams of fat, and others are popular topics. Cholesterol is a necessary part of normal health. The type and amount consumed can be controlled by what a person eats. Fats are either saturated, monounsaturated, or polyunsaturated depending on the number of double bonds between carbon atoms. A balance of all three types in the diet is recommended. Fiber influences intestinal health and is therefore very important. There are many diseases related to dietary deficiencies, imbalances, and over indulgence. Many of these health problems can be minimized by a balanced diet that includes an appropriate caloric intake.

Credits

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