Chapter 7

"**Proteins: The Body's Building Blocks"**

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Protein is an energy-yielding nutrient composed of carbon, hydrogen, oxygen and nitrogen. The presence of nitrogen is what makes proteins different from carbohydrates and fats.

Amino acids are the building blocks of protein molecules. Most proteins are made up of combinations of 20 amino acids which are linked in strands.

Types of Amino Acids

Essential amino acids cannot be made by your body. You must get them from the foods you eat.

Non-essential amino acids are the acids your body can make.

DNA (deoxyribonucleic acid) is found in every nucleus of a cell. It has the instructions for how amino acids will be linked to form the proteins in your body.

Protein molecules can change their shape and take on new characteristics. This is called **denaturation.**

Heat, acids, bases and alcohol are among the factors that can denature proteins.

Once proteins are denatured, they can never return to their original state. Ex. When an egg or meat is cooked or meat is marinated.

Protein in the Body

When you eat proteins, stomach acid denatures the proteins. This makes it easier for enzymes in the stomach to begin to break down large protein molecules into smaller pieces. Enzymes in the small intestine break polypeptides into single amino acids. The amino acids are absorbed into the bloodstream. The blood carries the amino acids to the cells that need them.

Where Proteins are Found



**Functions of Proteins**

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**1.** **Build and Maintain Tissue**

 - Protein makes up about 18 to 20 percent of your body.

**2.** **Make Important Compounds**

 - Enzymes are proteins that cause specific reactions in the body.

 - Hormones control specific body processes.

 - Antibodies are proteins that defend the body against infection and disease.

**3.** **Regulate Mineral and Fluid Balance**

 - Proteins help carry sodium and potassium from one side of cell walls to the other.

 - These minerals and proteins control the flow of water through cell membranes.

 - A balance of fluid inside and outside the cell is crucial as it required for the normal functioning of the heart, lungs, brain and every other cell.

**4.** **Maintain Acid-Base Balance**

 - Acid-base balance refers to the maintenance of the correct level of acidity of a body fluid.

 - Proteins act as buffers -> compounds that counteract an excess of acid or base in a fluid.

**5.** **Carry Vital Susbstances**

 **-** Lipoproteins transport fats in the bloodstream.

 - Proteins also transport nutrients and oxygen in the blood.

**6.** **Provide Energy**

- The body uses proteins as a source of energy if carbohydrates and fats are lacking in the diet or if there is an excess of protein in the diet.

 - Proteins yield 4 calories/gram of energy.

**Food Sources of Protein**

**Animal**

beef, pork, veal,

lamb, poultry, fish

eggs, milk, yogurt,

cheese, ice cream

**Plant**

Grains, nuts, seeds, legumes, peanuts, black-eyed peas, kidney beans, black beans, lentils, chickpeas, lima beans, soybeans, tofu

|  |  |  |
| --- | --- | --- |
|  | **Animal Sources** | **Plant Sources** |
| Examples | **Beef, veal, pork, poultry, wild game, fish** | **Grains, nuts, seeds, legumes, peanuts, kidney beans, black beans, chickpeas, lima beans** |
| Quality | **The best** | **Soybean and Quinoa-highest in protein** |
| Advantages | **Has all essential amino acids** | **Cheaper****Less fat****More fiber****Less calories** |
| Disadvantages | **Expensive****Adds fat to diet** | **Has to be eaten in certain combinations** |

Do you choose more protein from plant or animal sources? Explain your response.

Meat and dairy products can be quite high in saturated fat.

The high cost of protein from animal sources often limit the

amount of animal protein low income families can buy.

1 ounce top round steak -> 8 grams of protein $0.23

1 ounce cheddar cheese -> 7 grams of protein $0.21

1/2 cup cooked dried beans -> 7 grams of protein $0.06

**Reasons for Being Vegetarian**

1. religious reasons

2. health reasons

3. socioeconomic reasons

4. environmental reasons

5. humanitarian reasons

**Types of Protein**

All of the essential amino acids humans need are present in complete proteins. Animal foods are sources of complete proteins

Incomplete proteins are missing or short in one or more of the essential amino acids. Plants are sources of incomplete proteins.

Complementary proteins are two or more proteins that can be combined to provide all the essential amino acids.

In general, combine grains, nuts, or seeds with legumes.

Incomplete proteins foods can be combined with complete protein foods.

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Protein Requirements – General

* Protein is not stored. You need it every day.
* The amount of protein needed is related to age, gender and body size.
* Children and teens have a higher proportional need for protein than people who are no longer growing.
* Women who are pregnant or breast-feeding need extra protein.
* Illness and injury increase the need for protein.

Protein Requirements – Specific

* 14 to 18 year old males: 52 grams/day
* 14 to 18 year old females: 46 grams/day
* 10 to 35% of daily calories should come from protein.
* Nutrition Facts panels give the amount of protein in grams.
* To meet protein needs, follow the Food Guide.

**Protein Deficiency**

A deficiency disease is a sickness caused by a lack of an essential nutrient.

Protein-energy malnutrition (PEM) is a condition caused by a lack of calories and proteins in the diet.

1. Kwashiorkor

 -> protein-deficiency disease

 -> usually strikes a child when the next sibling is born

 -> full growth potential is not reached

 -> bloated abdomen and skinny arms and legs

 -> fluid balance and immune system are affected

2. Marasmus

 -> protein-deficiency disease

 -> a wasting disease

 -> most often affects infants

 -> muscles and tissues waste away

 -> children become thin, weak, susceptible to infection

 and disease

 -> children are suffering from starvation

**Excess Proteins in the Diet**

1. Liver and Kidney Problems

 - A high-protein diet produces an excess of nitrogen waste.

 - The liver converts nitrogen waste into urea.

 - The kidneys excrete urea in the urine.

 - Excess protein creates extra work for the liver and kidneys.

 - Stress on these organs can cause them to age prematurely.

2. Calcium Loss

 - High protein diets may contribute to loss of calcium in bones.

 - A loss of calcium weakens bones and leads to other health

 problems.

3. Excess Body Fat

 - The body cannot store excess amino acids as a protein source.

 - The body can convert excess amino acids into body fat.

 - Excess body fat is associated with a number of health problems.