



Nutrition & Diet Therapy Third Stage

First Semester 2022-2023

Lecture Two : Part2- Protein



Ass.Lec. Iman Hadi Auda

Ass.Lec. Maryem Jawad Abd alateef

Branch of Basic Medical Sciences
College of Nursing
University of Basrah

Proteins

- Proteins are complex organic molecules that are chemically similar to lipids and carbohydrates because they contain carbon, hydrogen, and oxygen atoms. Proteins, however, contain nitrogen, the element cells need to make a wide array of important biological compounds.
- Skin, blood, nerve, and bone all cells in your body contain proteins.
- Structural proteins such as collagen are in your cartilage, ligament, and bone tissue. Keratin is another structural protein; it is in your hair, nails, and skin.

Proteins

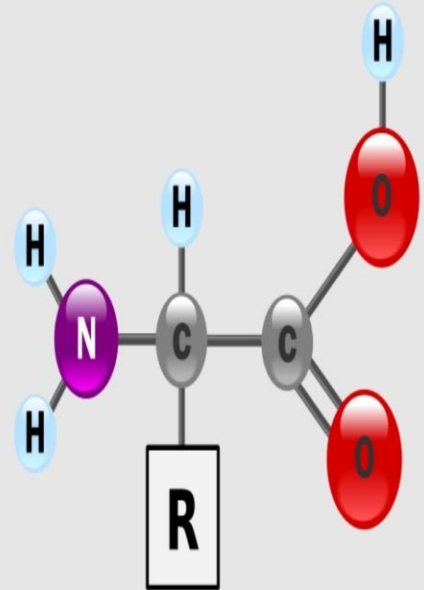
- ▶ Contractile proteins in your muscles enable you to move, and the pigment protein melanin determines the color of your eyes, hair, and skin.
- ▶ Hormones, are proteins. Hormones are chemical messengers that regulate body processes and responses, such as growth, and metabolism.
- ▶ Enzymes are proteins. Enzymes speed up the rate of (catalyze) chemical reactions without becoming a part of the products.
- ▶ Antibodies are proteins (infection fighting).

Protein Quality

- ▶ The animal food sources provide the **highest quality** of **complete proteins**: proteins that contain all the essential amino acids such as meats, fish, poultry, eggs, milk, and cheese.
- ▶ The plant food sources provide the **lowest quality** of **incomplete proteins**: proteins that lack one or more of the essential amino acids such as lentil, peas, soybeans, corn, grains and nuts.
- ▶ **complementary proteins**: incomplete proteins that when combined together are provide all ten essential amino acids

Amino acids

chemical compounds which are sometimes called the building blocks of protein because they are combined to form the thousands of proteins in the human body. All amino acids have the same basic design, there is both a nitrogen-containing amino portion and carboxylic acid portion attached to a central carbon atom.



LIFE STAGE GROUP	AGE	PROTEIN (GRAMS/DAY)
<i>Infants</i>	0–6 mo	9.1
	7–12 mo	11.0
<i>Children</i>	1–3 y	13
	4–8 y	19
<i>Males</i>	9–13 y	34
	14–18 y	52
	19–30 y	56
	31–50 y	56
	51–70 y	56
	> 70 y	56
<i>Females</i>	9–13 y	34
	14–18 y	46
	19–30 y	46
	31–50 y	46
	51–70 y	46
	> 70 y	46
<i>Pregnancy</i>	14–18 y	71
	19–30 y	71
	31–50 y	71
<i>Lactation</i>	14–18 y	71
	19–30 y	71
	31–50 y	71

Essential Amino Acids that body cannot synthesize so must be obtained through food	Nonessential Amino Acids that body can manufacture with enough amount
Tryptophan	Alanine
Valine	Proline
Threonine	Tyrosine
Isoleucine	Cysteine
Leucine	Serine
Lysine	Glutamine
Phenylalanine	Glutamic acid
Methionine	Glycine
Arginine*	Asparagine
Histidine*	Aspartic acid

Protein Denaturation

- A protein undergoes denaturation when it is exposed to various conditions that alter the natural folded and coiled shape. We often cook protein foods to make them more digestible and safe to eat, but **heat** also causes the proteins in foods to unfold, for example, egg is almost clear and has a jellylike consistency. When you cook egg it becomes firm as its proteins become denatured. Other treatments often used during food preparation also denature proteins, including **whipping or exposing them to alcohol or acid**.

Protein Turnover

Not all protein must be supplied by the diet. Protein turnover, the process of breaking down old or unneeded proteins into their component amino acids and recycling them to make new proteins, occurs constantly within cells. Amino acids that are not incorporated into proteins become part of a small amino acid pool, a readily available supply of amino acids that cells can use for future protein synthesis. The amino acid pool is an endogenous, or internal, source of nitrogen.

Functions

- ▶ Source of energy (4 kcal/g)
- ▶ Structural tissue building
- ▶ Water balance through osmotic pressure
- ▶ Buffer agent to help maintain pH balance
- ▶ Digestion and metabolism through enzymatic action
- ▶ Cell signaling (hormones) and transport (e.g., hemoglobin and transferrin)
- ▶ Immunity (antibodies)

Mouth
Mechanical digestion creates smaller food pieces that mix with saliva.

Stomach
Stomach mucosa secretes pepsinogen. Pepsinogen is activated to *pepsin* by HCl:

$$\text{Protein} \xrightarrow[\text{HCl}]{\text{pepsin}} \text{smaller polypeptides}$$

Small Intestine
Pancreatic and intestinal proteases continue hydrolysis:

$$\text{Polypeptides} \xrightarrow[\text{intestinal proteases}]{\text{pancreatic and}} \text{dipeptides amino acids}$$

 Pancreatic enzymes: *trypsin, chymotrypsin, and carboxypeptidase*
 Intestinal enzymes: *aminopeptidase and dipeptidase*

$$\text{Peptides} \xrightarrow[\text{dipeptidase}]{\text{aminopeptidase}} \text{amino acids}$$

 Absorbed amino acids enter the portal blood and travel to the liver

Summary of protein digestion

Metabolism and Elimination

All essential amino acids must be present to build and repair the cells as needed. When amino acids are broken down, the nitrogen-containing amine group is stripped off. This process is called deamination. Deamination produces ammonia, which is released into the bloodstream by the cells. The liver picks up the ammonia, converts it to urea, and returns it to the bloodstream for the kidneys to filter out and excrete. The remaining parts are used for energy or are converted to carbohydrate or fat and stored as glycogen or adipose tissue.

Case in point: ANIKA- FOLLOWING A PROTEIN DIET

■ Anika, a college student from Germany, has been on the Atkins diet for 6 months and finds that she misses eating fruit and vegetables. She has seen a weight reduction with Atkins but is tired of all the meat and fats. Anika has been investigating the new rage-the South Beach diet. Because this diet allows for more vegetables and fruits, Anika thinks this is the way to go to lose the weight she wants, keep it off, and have fruits and vegetables.

■ ASSESSMENT

1. What data do you have about Anika's eating habits?
2. What do you know about her ability to develop habits?
3. What is the cause of the current dissatisfaction?

■ DIAGNOSIS

4. Complete the following diagnostic statement:

Imbalanced nutrition, more than body requirements, as evidenced by _____ .

5. Complete the following diagnostic statement:

Deficient knowledge related to a lack of information about _____ .