



HME103-Principles of Nutrition

Components in foods and their relationship with health: Metabolism and Deficiency of Proteins

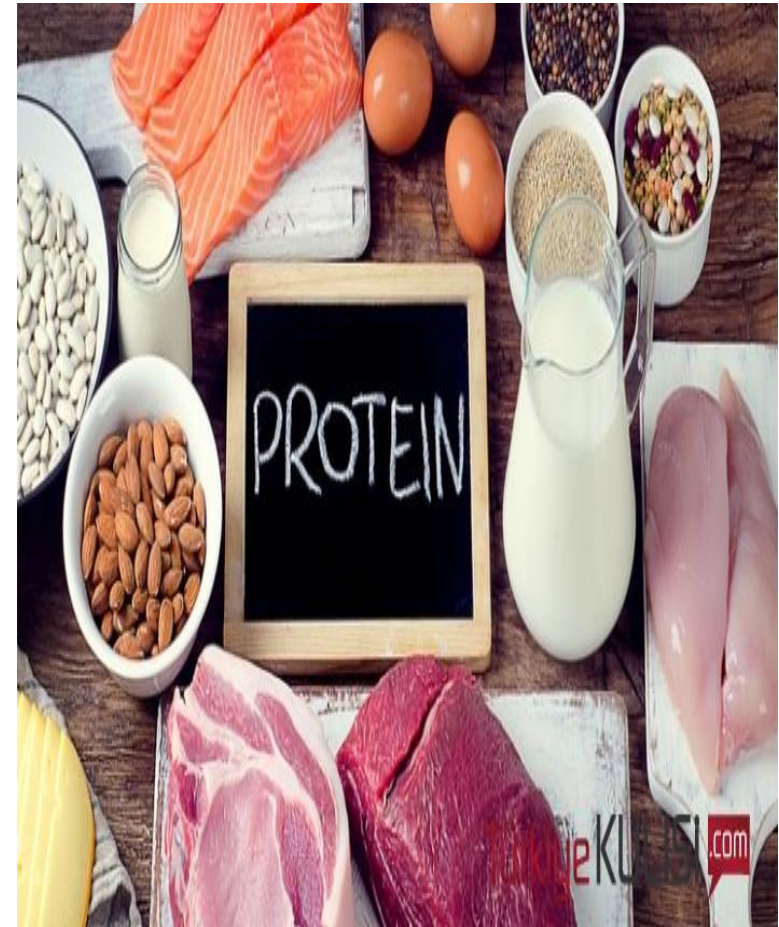
Lesson Code: HME103-Principles of Nutrition

Instructure: Assoc.Prof. Dr. Elif Feyza TOPDAŞ

atauni.edu.tr    Atauni1957

Metabolism of proteins

- Proteins must be broken down into amino acids in order to be absorbed. Because proteins and many polypeptides cannot cross cell membranes.
- However, amino acids can be easily taken into the cell.

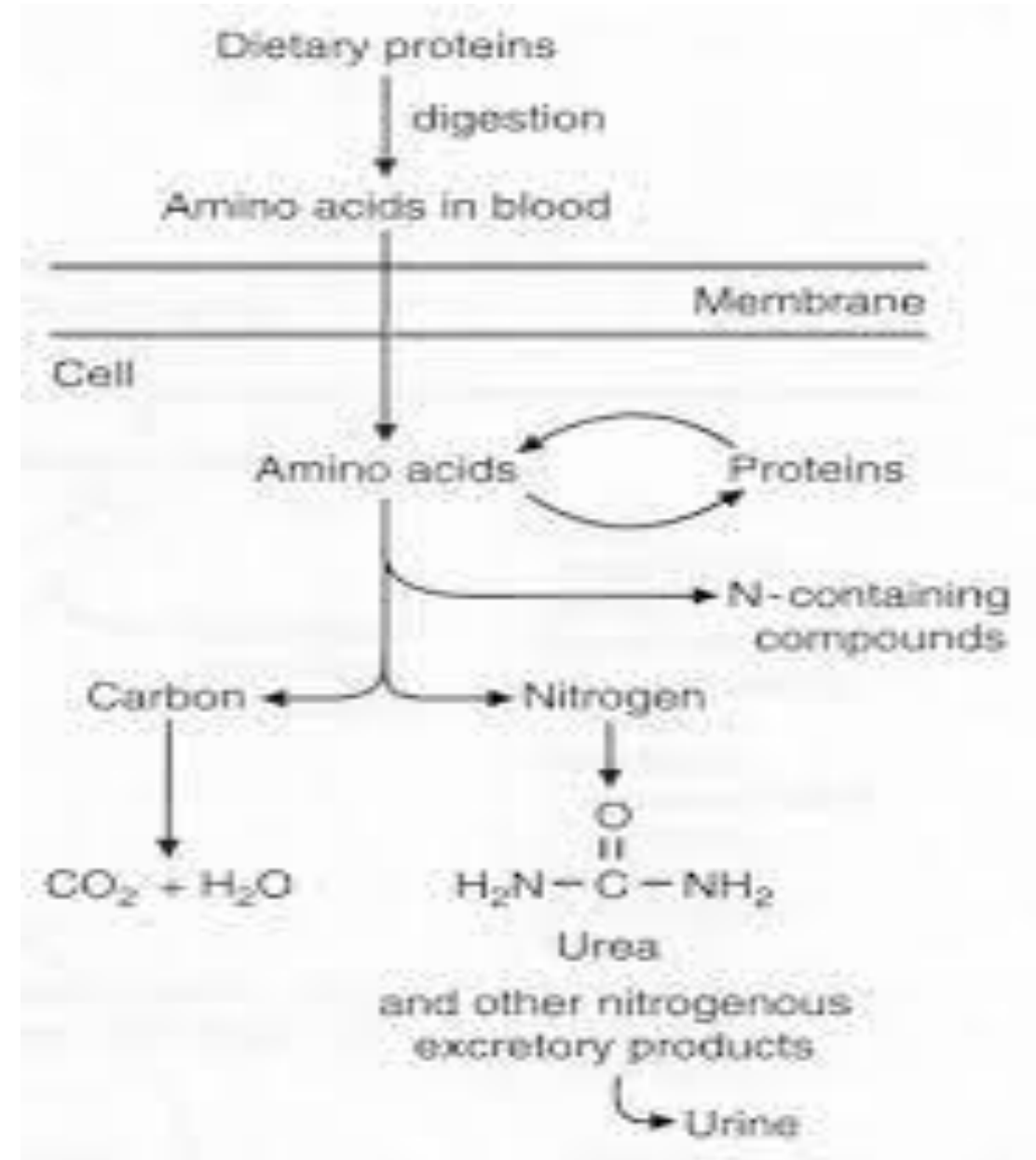


Metabolism of proteins

Protein digestion in the stomach

- Protein digestion begins in the stomach and is carried out by pepsin.
- Proteins are broken down into polypeptides
- Pepsin is found in the gastric mucosa in its inactive form, pepsinogen. After being secreted into the gastric cavity, it turns into active pepsin by the autocatalytic effect of HCl and pepsin.

After digestion in the stomach through these prostheses, the peptide mixture is sent to the intestines with the stomach contents.



Metabolism of proteins

Protein digestion in the intestines is carried out by proteinases delivered to the intestines by pancreatic secretion. The most important of these are **trypsin, chymotrypsin, carboxy-peptidases A and B and elastase**. Trypsin and chymotrypsin are endopeptidases and hydrolytically cleave the peptide bonds in the inner parts of the peptide chain.

Under the action of these two enzymes, peptide chains of 600-3000 molecular weight, which pass into the intestines with gastric contents, are broken down into smaller peptide chains. These small peptide chains are broken down into dipeptide and free amino acid mixtures by carboxypeptidases A and B, which come with pancreatic fluid, and aminopeptidases released by intestinal mucosa cells.



Metabolism of proteins

ABSORPTIONS OF PEPTIDES AND AMINO ACIDS

Absorption of Peptides: Peptide bonds are broken by peptidases found in mucosal cells, and the free amino acids formed are released into the blood.

Absorption of Amino Acids

For amino acid transport, there is an active transport system in mucosal cells that carries out energy-dependent transport to the direction where the concentration is high.

- Amino acids are then transported to all tissues through the bloodstream.
- Amino acids enter tissue cells through active transport, where they are used in protein synthesis or are destroyed.

Diseases Occurring as a Result of Protein Deficiency

The body has no significant protein stores. The small amount of reserve protein is only enough to cover short-term deficiencies.

If the amount of protein taken in is less than that excreted due to body growth and metabolic activities, various protein deficiency symptoms appear.

Protein deficiency problems are pretty common, especially during the rapid growth period, since there is insufficient protein to meet the excess requirement.



Causes of Protein Deficiency:

- Inadequate intake (poverty, unconsciousness, loss of appetite)
- Digestive or absorption disorders (celiac disease, inflammatory bowel diseases, etc.)
- Loss of protein in the urine due to kidney disease (nephrotic syndrome) Losses in chronic bleeding conditions (such as Ulcerative Colitis)
- Loss of protein from wound oozing in burns
- Liver failure (reduced albumin production)
- Utilisation of proteins to provide energy as a result of inadequate total energy and carbohydrate intake in the diet



Diseases Occurring as a Result of Protein Deficiency

The most common diseases as a result of protein deficiency are **Kwashiorkor** and **Marasmus**.

The first sign of protein deficiency is that growth slows down and stops over time. Kwashiorkor disease occurs when the child does not get enough protein for a long time.

If the child is inadequately nourished in terms of protein and energy, **Marasmus** disease occurs.

The main symptoms of **Kwashiorkor** are; water accumulation in the body (edema), fatty liver, spleen enlargement, skin wounds and hair color change. **Marasmus** is determined by excessive weight loss.

Marasmus and Kwashiorkor Diseases



Diseases Occurring as a Result of Protein Deficiency



Although Kwashiorkor disease is not common in our country, Marasmus cases are common in children between 6 months and 3 years. The reason for this is that after 6 months, although the mother's milk is not enough to meet the child's increasing protein and energy needs, appropriate protein-rich foods are not given to babies.

After the age of three, Marasmus is less common as the child meets his energy and protein needs by eating a variety of foods.

Diseases Occurring as a Result of Protein Deficiency

Protein deficiency not only slows down the child's physical growth. There are also regressions in mental development. **Mental retardation** in children who receive insufficient energy in quantity and quality for a long time may continue throughout their lives.

When insufficient protein is taken, the body's resistance against disease-causing microbes decreases. As a result, the body gets sick easily and the disease progresses severely. In addition, **cirrhosis** is more common in protein deficiency because the overworked liver cells cannot be renewed.

