PROTEIN

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OBJECTIVES OF THE LECTURE

- By the end of this lecture, student can:
  - Define what is protein
  - Explain the structure, roles and metabolism of protein
  - Explain the impact of deficiency and excessive intake of protein
PROTEIN

- Protein contains atoms Carbon (C) hidrogen (H), oxygen (O) and Nitrogen (N).
- Nitrogen atoms give the name amino to the amino acids

```
H — N — C — C — O — H
|     |     |
|     |     |
H     H
```

side group varies

amino group  acid group
Amino acids have the basic structure:

- A central carbon atom with a hydrogen (H) and amino group (NH2) and acid group (COOH).
- 20 type acids amino.
- The simplest amino acid is glycine (one hydrogen).
- The slightly more complex amino acid is alanina (extra carbon with three hydrogen).
## Amino Acids

<table>
<thead>
<tr>
<th>Essential A.A</th>
<th>Nonessential A.A:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Histidine</td>
<td>Alanine</td>
</tr>
<tr>
<td>Isoleucine</td>
<td>Arginine</td>
</tr>
<tr>
<td>Leucine</td>
<td>Asparginine</td>
</tr>
<tr>
<td>Lysine</td>
<td>Aspartic acid</td>
</tr>
<tr>
<td>Methionine</td>
<td>Cysteine</td>
</tr>
<tr>
<td>Phenylalanine</td>
<td>Glutamic acid</td>
</tr>
<tr>
<td>Threonine</td>
<td>Glutamine</td>
</tr>
<tr>
<td>Tryptophan</td>
<td>Glycine</td>
</tr>
<tr>
<td>Valine</td>
<td>Proline</td>
</tr>
<tr>
<td></td>
<td>Serine</td>
</tr>
<tr>
<td></td>
<td>Tyrosine</td>
</tr>
</tbody>
</table>
Acid Amino Structure

Tyr (Tyrosine)

Asp (Asparagine)

Val (Valine)
Amino Acids

- **Essential Amino Acids (EAA)**
  Amino acids that the body cannot make at all or cannot make in sufficient quantity to meet its needs. It must supply from the diet.

- **Non-essential Amino Acids (NON-EAA)**
  Body can synthesize itself, but food also can deliver nonessential amino acids.
Each amino acid is connected to the next by a peptide bond
- Is a bond that connects the acid end of one amino with the amino end of another, forming a link in a protein chain.

Dipeptides bond
- Two amino acids bonded together

Tripeptides
- Three amino acids bonded together

Polypeptides
- Many (ten or more) amino acids bonded together.

Oligopeptides
- An intermediate string of four to nine amino acids
PEPTIDE BOND

Peptide bond - links Carbon of acid group to Nitrogen of amine group
Types of Protein

• Complete and incomplete proteins.
  • Complete: a dietary protein containing all the EAA in relatively the same amount that human being require. Its may also contain Non-EAA
  • Incomplete: EAA found in the shortest supply relatively to the amount needs in human body.
    • Lysine
    • Methionine
    • Threonine
    • Tryptophan

• Natural and unnatural proteins.
  • Natural: Protein natural from environment
  • Unnatural protein : Protein already change the structure due to physical factors -heat
Types of Protein

- **Simple and conjugate proteins**
  - Simple: contain only amino acid
  - Conjugate: combination amino acids with other elements
    - Nucleoprotein = Protein + Nucleic acids (RNA & DNA)
    - Lipoprotein = Lipid + Protein
    - Glycoprotein = Carbohydrate + protein
Collagen is a type of protein. Fibrous in nature, it connects and supports bodily tissues, such as skin, bone, tendons, muscles, and cartilage. Internal organs, teeth. More than 25 types. Gives body tissues form and provides firmness and strength; elastin, flexibility. It is used in some cosmetic surgery procedures and is sold as a supplement created for joint mobility. Treating and managing serious burns-creating man-made skin substitutes.
Collagen

Skin Recovery Collagen Mask

- Phyto Collagen
- Dipotassium Glycyrrhizinate
- Green Tea Extract, Vitamin E

1 sheet EASY & EFFECTIVE SKIN SOLUTION
All Skin Types, 4 Seasons
Proteins Turnover

Amino Acids from Breakdown of Body Protein

Amino Acids from Diet

Amino Acid Pool

Synthesis of Body Proteins (for cell structure and other components e.g., enzymes, hormones, antibodies)

Metabolised to:
- Energy
- Glucose
- Fat
- Other components

Elimination of Amino Group (Nitrogen) mainly as Urea in the Urine
Role of Protein

- **Growth and maintenance**
  - Protein form integral parts of most body structures such as skin, tendons, membranes, muscles, organ and bones. Support the growth and repair of the body tissues.

- **Enzymes**
  - Proteins facilitate chemical reactions

- **Hormones**
  - Proteins regulate body processes

- **Antibodies**
  - Proteins inactive foreign invaders, thus protecting the body against diseases
Role of Protein

- **Fluid Balance**
  - Proteins help to maintain the volume and composition of body fluids
  - Edema: cause by decrease plasma protein
- **Acids-Base balance.**
  - Proteins help maintain the acid-base balance of fluids by acting as buffers
- **Transportation**
  - Proteins transport substance, such as lipid, vitamins, minerals and oxygen around the body.
- **Energy**
  - Proteins provide some fuel for the body's energy needs.
Health Problem Related to Protein (Marasmus)
Kwashiorkor
Kwashiorkor
Kwashiorkor:
- Swelling of legs (oedema)
- Sparse hair
- Moon face, with little interest in surroundings
- Flaky appearance of skin
- Swollen abdomen
- Thin muscles, but fat present

Marasmus:
- Normal hair
- Old man or wizened appearance
- Thin limbs with little muscle or fat
- Very underweight body

Distribution of world population and shares of cereal production.
Loss of weight and growth failure

- Hair changes
- Mental changes
- Wasting
- Anaemia
- Diarrhoea
- Dermatosis (flaky-paint)
- Oedema
THANK YOU