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#### QUESTION

- 1.What do you understand by the term “BIOLOGICAL VALUES OF PROTEIN “
2. List and explain the various method of assessment of protein quality

#### ANSWERS :

##### 1. Biological values of protein:

Biological value (BV) is a measure of the proportion of absorbed protein from a food which becomes incorporated into the proteins of the organism's body. It captures how readily the digested protein can be used in protein synthesis in the cells of the organism. Proteins are the major source of nitrogen in food. BV assumes protein is the only source of nitrogen and measures the proportion of this nitrogen absorbed by the body which is then excreted. The remainder must have been incorporated into the proteins of the organism's body. A ratio of nitrogen incorporated into the body over nitrogen absorbed gives a measure of protein "usability" – the BV.

Unlike some measures of protein usability, biological value does not take into account how readily the protein can be digested and absorbed (largely by the small intestine). This is reflected in the experimental methods used to determine BV.

BV uses two similar scales:

- The true percentage utilization (usually shown with a percent symbol).
- The percentage utilization relative to a readily utilizable protein source, often egg (usually shown as unitless).

These two values will be similar but not identical.

The BV of a food varies greatly, and depends on a wide variety of factors. In particular the BV value of a food varies depending on its preparation and the recent diet of the organism. This makes reliable determination of BV difficult and of limited use — fasting prior to testing is universally required in order to ascertain reliable figures.

BV is commonly used in nutrition science in many mammalian organisms, and is a relevant measure in humans. It is a popular guideline in bodybuilding in protein choice.

Three major properties of a protein source affect its BV:

- Amino acid composition, and the limiting amino acid, which is usually lysine
- Preparation (cooking)
- Vitamin and mineral content

2. Method of assessment of protein quality : We have four methods of assessment of protein quality which are:

1. Chemical score or amino acid score
2. Net protein utilization (NPU)
3. Protein efficiency ratio (PER)
4. Biological value (BV).

1. Chemical score or amino acid score:

It is a measure of the concentration of each essential amino acid in the test protein which is then compared

with reference protein (usually egg protein). It is calculated by following formula:

$$\text{Amino acid Score} = \frac{\text{Number of mg of one Amino acid per gm of test Protein}}{\text{number of mg of the same Amino acid per gm of egg Protein}} \times 100$$

This mode of chemical assessment does not take into account the digestibility of dietary proteins.

Hence, biological methods based on growth or nitrogen(N) retention are used to determine the overall quality of a protein.

2. Net protein utilization (NPU):

- It is a product of digestibility coefficient and biological value divided by 100.
- Biological measures of NPU gives a more complete expression (both absorption and retention) of protein

quality than the amino acid score as said above. It is calculated by the following formula:

$$\text{NUP} = \frac{\text{Nitrogen retained by the body}}{\text{Nitrogen intake}} \times 100$$

- The protein requirement varies with the NPU of dietary protein. If the NPU is low, the protein requirement is high and vice versa.
- The NPU of the protein of Indian diets varies between 50 and 60.

3. Protein efficiency ratio (PER) :

The overall quality, i.e. nutritive value of a food protein can be determined with laboratory animals like rats as follows.

The gain in weight of young animals per gm of protein consumed is measured and the value obtained is used to determine the protein efficiency ratio (PER) as follows:

$$\text{PER} = \frac{\text{Gain in the body weight in gm}}{\text{Protein ingested in gm}}$$

4. Biological value: Biological value of protein is defined as the percentage of absorbed nitrogen retained by the body and is calculated by:

$$\text{Biological value (BV)} = \frac{\text{Nitrogen retained}}{\text{Nitrogen absorbed}} \times 100$$

- The amount of nitrogen in the diet eaten and in excreta of adult animals are measured and the percentage of nitrogen retained by animals out of nitrogen absorbed from the diet is calculated. The value thus obtained is the “biological value” (BV) of the protein.
- This test also gives an estimate of digestibility of the protein. But it cannot take into account the nitrogen that might be lost during the digestion process. The chemical score, BV, NPU, PER and deficient amino acids of some important food protein are given.