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DEPARTMENT: HUMAN ANATOMY

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COURSE TITLE: MEDICAL BIOCHEMISTRY II

1. WHAT DO YOU UNDERSTAND BY THE TERM ''BIOLOGICAL VALUE OF PROTEINS"

2. LIST AND EXPLAIN THE VARIOUS METHODS OF ASSESSMENT OF PROTEIN QUALITY.

BIOLOGICAL VALUE OF PROTEINS

Biological value 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. Biological value 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 organisms body. A [ratio](https://en.wikipedia.org/wiki/Ratio) of nitrogen incorporated into the body over nitrogen absorbed gives a measure of protein usability which is the biological value.

It uses two similar scales:

* The true percentage utilization
* The percentage utilization relative to a readily utilizable protein source

These two values will be similar but not identical. The biological value of a food varies greatly, and depends on a wide variety of factors. In particular the biological 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.

METHODS OF ASSESSMENT OF PROTEIN QUALITY

1. Biological value
2. Net protein utilization (NPU)
3. Protein efficiency ratio
4. Protein digestibility-corrected amino acid score (PDCAAS)
5. Biological value:

The biological value (BV) of a protein is an expression of a number of the nutritional characteristics of the food. These include:

(1) the digestibility,

(2) the availability of the digested products, and

(3) the presence and amounts of the various [essential amino acids](https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/essential-amino-acids).

The biological value can be calculated by determining the nitrogen of the food intake minus the urinary and fecal nitrogen excretions by the formula:

BV=Dietary N-(Urinary N+Fecal N) / Dietary N-Fecal N×100

For optimum utilization of protein all the essential amino acids must be liberated during digestion at rates allowing mutual supplementation. If a high biological value protein contains a balance of amino acids in the proportion required by the body, then probably an excessive addition of one or more amino acids can cause an imbalance

1. Net protein utilization (NPU)

Net protein utilization (NPU) is another index which combines a measure of the biological value and the digestibility of the protein in a diet. For a given diet, NPU is determined by calculations from chemical score data:

NPU=biological value ×digestibility/ N retained/N intake

Net protein utilization is determined under standard conditions at a fixed level of protein intake below maintenance and is a practical method of evaluating differences in protein quality.

1. Protein efficiency ratio

[Protein efficiency ratio](https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/protein-efficiency-ratio) (PER) is the easiest method of assessing the quality of proteins. Generally accepted is the idea that the rate of growth of weanling rats under standardized conditions provides a reliable measure of the value of [dietary protein](https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/protein-intake); thus PER is the gain in body weight divided by the amount of protein consumed:

PER=weight gain/ protein intake

Such factors as the age of the rats, length of the experimental period, level of protein, and the sex of the rat affect the PER assay. Optimum standardized conditions such as a four-week experimental feeding period, diets containing a 10% level of protein with sufficient amounts of all other essential nutrients, male rats, and ad libitum feeding schedule have been demonstrated by several laboratories to yield reproducible results.

1. Protein digestibility-corrected amino acid score (PDCAAS)

PDCAAS is a method of evaluating the [quality of a protein](https://en.wikipedia.org/wiki/Protein_quality) based on both the [amino acid](https://en.wikipedia.org/wiki/Amino_acid) requirements of humans and their ability to digest it. Using the PDCAAS method, the protein quality rankings are determined by comparing the amino acid profile of the specific food protein against a standard amino acid profile with the highest possible score being a 1.0. This score means, after [digestion](https://en.wikipedia.org/wiki/Digestion) of the protein, it provides per unit of protein 100% or more of the [indispensable amino acids](https://en.wikipedia.org/wiki/Essential_amino_acid) required. The formula for calculating the PDCAAS percentage is: (mg of [limiting amino acid](https://en.wikipedia.org/wiki/Limiting_amino_acid) in 1 g of test protein / mg of same amino acid in 1 g of reference protein) x fecal true digestibility percentage

The PDCAAS value is different from measuring the quality of protein from the [protein efficiency ratio (PER)](https://en.wikipedia.org/wiki/Protein_efficiency_ratio) and the [biological value](https://en.wikipedia.org/wiki/Biological_value) (BV) methods. The PER was based upon the amino acid requirements of growing rats, which noticeably differ from those of humans. The PDCAAS allows evaluation of food protein quality based on the needs of humans as it measures the quality of a protein based on the amino acid requirements (adjusted for digestibility) of a 2- to 5-year-old child (considered the most nutritionally demanding age group).