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COURSE TITLE: MEDICAL BIOTECHNOLOGY II

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ASSIGNMENT: WHAT DO YOU UNDERSTAND BY THE TERM “BIOLOGICAL VALUE OF PROTEINS”

LIST AND EXPLAIN THE VARIOUS METHODS OF ASSESSMENT OF PROTEIN QUALITY

BIOLOGICAL VALUE OF PROTEINS

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 exerted. The remainder must have been incorporated into the protein of the organism's body. A ratio of nitrogen incorporated into the body over nitrogen absorbed gives a measure of protein "usability"- the BV. BV does not take into account how readily the protein can be digested and absorbed. This is reflected in the experimental methods used to determine BV.

BV uses two similar scales:

- The true percentage utilization
- The percentage utilization relative to a readily utilized protein source, often egg.

The 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 organism and is a relevant measure in humans. It is a particular guideline in bodybuilding in protein

choice.

LIST AND EXPLAIN THE VARIOUS METHODS OF ASSEMENT OF PROTEIN QUALITY

- Biological value (BV)
- Net protein utilization (NPU)
- Amino acid score
- Critique
- Protein efficiency ratio (PER)
- Net protein ration (NPR)
- Relative nutritive value (RNV)
- Nitrogen balance index
- Tissue regeneration
- Microbiological assays
- Plasma amino acids

Biological value (BV): it is defined as the percentage of absorbed nitrogen retained in the body and a complete elevation of the dietary protein includes measurement of the biological value and the digestibility.

Net protein utilization (NPU): like the biological value, the NPU estimates nitrogen but in this case by determining the difference between the body nitrogen content of animals fed no protein and those fed a test protein. Since both NPU and BV are based upon estimates of “retained nitrogen” they should measure the same thing except in the calculation of NPU the denominator is the total protein eaten whereas in the calculation of BV, it is the amount absorbed. BV would be expected to be higher than NPU by the amount of nitrogen lost owing to lack of digestibility.

Amino acid score: amino acid score have been calculated as the “percentage of adequacy” rather than as deficits. Egg, cow milk and human milk are all considered ideal for the calculation of amino acid score.

Critique: critique is the use of estimates of protein quality to calculate the amount of protein needed to meet requirements when different diets are consumed, it requires that the estimate of quality vary in some known fashion, preferably in linear fashion from zero to 100% utilization.

Protein efficiency ratio (PER): qualitative difference in protein quality can be demonstrated by many methods. Protein efficiency ratio has been the method most widely used because of its simplicity. Osborne, Mendel and Ferry observed that young rats fed certain proteins gained little weight and ate little protein, whereas those which were

fed better quality proteins gained more weight and consumed more protein. In an attempt to compensate for the difference in food intake, they calculated the gain in weight per gram of protein eaten and this has been called PER. It is known that the PER for any protein is dependent upon the amount of protein incorporated in the test diet.

Net protein ration (NPR): it is calculated as the overall difference in gain divided by the protein eaten. It is apparent that if body composition is constant, this procedure is identical to NPU except that it is expressed in arbitrary units which are less useful than the percentage of protein utilized.

Nitrogen balance index: the biological value is the slope of the regression line relating nitrogen balance and nitrogen intake, it is suggested that this might have certain advantages in practice over the usual method of determining BV. The concept of this index is rather similar to relative nutritive value discussed above, since it is becoming increasingly clear that nitrogen retention is not linearly related to nitrogen intake in the region of intake below maintenance, the validity of the index requires confirmation.

Tissue regeneration: this is for the recovery of the weight of specific tissues which is to gain the weight of young rats in the laboratory.

Microbiological assays: many microorganisms require the essential amino acids. Their growth response are supplied with limited amounts of various proteins or proteins hydrolysates would provide a simple and efficient assay of nutritive value.

Plasma amino acid: it is of note that changes in plasma amino acid level after feeding of various proteins under certain conditions yield estimates of the nutritive quality. The range of the amino acid in the plasma of a normal animal is relatively large. This variability imposes serious limitations upon the quantitative interpretation of any changes in the levels observed.