

## **Lecture 12**

### **PROTEIN QUALITY AND EVALUATION OF FEED STUFFS**

#### **BIOLOGICAL EFFICIENCY OF A DIETARY PROTEIN**

It depends not only on the balance of available amino acids but also in the nitrogen and energy intake nutrient digestibility, the species and physiological stage of the animals.

The biological efficiency is also affected by the presence or absence of bacteria or fungi toxins, the rancidity of the associated fat, the content of vitamins, minerals and other essential nutrients that accompany it in a diet. Effect of physiological status of animals on protein utilization;

Animal in a growing phase are able to utilize protein better than adult animals. Pregnancy and lactation also improve protein utilization while infection, emotion and injury reduce the utilization efficiency of protein.

#### **METHODS OF EVALUATION OF PROTIEN QUALITY**

##### **PROTEIN EFFICIENCY RATIO (PER)**

It expresses numerically the growth promoting value of protein. It involves using weight of protein intake in a test diet to divide the weight gain by animal on the test diet. It is assumed that the primary function of a dietary protein is to furnish a mixture of amino acid in a proper pattern for the synthesis of tissue protein.

PER have a high correlation ( $r = 0.736$ ) with biological value. However, despite its long history and wide usage, PER may not be a very good assay procedure based on the following facts;

- i. the results are influenced by the level of protein consumed.
- ii. no allowance is made for the quantity of protein used for maintenance
- iii. gain in body weight does not necessarily correspond to gain protein

### **NET PROTEIN RETENTION (NPR)**

Some improvements can be made to some of the short coming of PER by including a group of animals consuming a non protein diet (basal diet).

$$\text{NPR} = \frac{\text{weight gain on a test diet} - \text{weight loss on a basal diet}}{\text{protein intake on a test diet}}$$

The basal diet is made up of a purified diet and it contains no any other nutrient than a principal one.

### **BIOLOGICAL VALUE (BV)**

It is the percentage of nitrogen absorbed from the GI tract which is available for productive body functions.

$$\text{BV} = \frac{\text{N intake} - \text{faecal nitrogen} - \text{urinary N}}{\text{N intake} - \text{faecal N}} \times 100$$

The Thomas Mitchell method of determining BV takes the metabolic and endogenous N losses into account

$$\text{BV} = \frac{\text{DNI} - (\text{FN} - \text{MFN}) - (\text{UN} - \text{EN})}{\text{DNI} - (\text{FN} - \text{MFN})}$$

- DNI - Dietary Nitrogen Intake
- FN - Faecal Nitrogen
- MFN - Metabolic Faecal Nitrogen
- UN - Urinary Nitrogen
- EN - Endogenous Nitrogen

### **NET PROTEIN UTILIZATION (NPU)**

It measures efficiency of growth by comparing body nitrogen resulting from animals fed a test protein with that of animal fed protein free diets for the same length of time.

There are two methods for this;

1. The carcass analysis technique

The nitrogen content of the animals on test diet and those of protein free diets are obtained and the formular below is applied;

$$\text{NPU} = \frac{\text{carcass N on test diet} - \text{carcass N on ... diet}}{\text{Total N intake on test diet}}$$

It is only suitable for small animals like rat.

2. Nitrogen depletion method

Animals are fed on protein free diet for a period of time sufficient to deplete the labile protein reserve. Animal are then placed on test diets and the response of the animals are measured. It is good for growing animals e.g. chicken and piglet.

**ADVANTAGES**

- i. homogeneity and sensitivity
- ii. linear response even at high protein intake
- iii. ease of execution
- iv. rapid response