

# **EVALUATION OF FEEDS FOR PROTEIN**

**Dept of Animal Nutrition,  
CoVSc & AH, Jabalpur**

- Usefulness of feed as a source of protein depends on two factors
  - Total concentration of protein
  - Distribution of amino acids
- Common methods
  - ✓ Crude Protein
  - ✓ True Protein “Stutzer’s reagent”
  - ✓ Digestible Crude Protein

# In Non Ruminants

## 1. Weight gain Methods

- Protein efficiency ratio
- Net protein retention
- Gross protein Value

## 2. Nitrogen Balance Experiments

- Biological value
- Net Protein utilization
- Protein replacement value

## 3. Body nitrogen retention method

## 4. Chemical Evaluation of protein from AA composition

- Chemical score
- Essential amino acid index

# WEIGHT GAIN METHODS

## i) Protein efficiency ratio (PER):

Weight gain per unit weight of protein consumed

$$\text{PER} = \frac{\text{Gain in wt.}}{\text{Protein intake}}$$

PER of wheat flour – 1.2 & skimmed milk powder- 2.8

Limitation:

- Tedious
- Cannot assess digestibility of protein
- Weight gain may be due to bone or fat formation

## ii) Net protein retention (NPR):

It is a modification of PER

$$\text{NPR} = \frac{\text{Weight gain of TPG} - \text{weight loss of NPG}}{\text{Protein intake}}$$

TPG- group fed on test protein

NPG- group fed on non protein diet

### iii) Gross protein value (GPV):

Chicks fed 8% protein for 2 weeks

After that divide into 3 groups

1<sup>st</sup> 80g CP/kg

2<sup>nd</sup> 80g CP/kg + 30g CP/kg of a test protein

3<sup>rd</sup> 80g CP/kg + 30g CP/kg of a casein

$$\text{GPV} = \frac{\text{g increased weight gain / g test protein}}{\text{g increased weight gain / g casein}}$$

# NITROGEN BALANCE EXPERIMENTS

## 1. Biological Value (BV): “Karl Thomas”

It is proportion of the nitrogen absorbed which is retained by the animal.

$$\% \text{ BV} = \frac{\text{N intake} - (\text{FN} + \text{UN})}{\text{N intake} - \text{FN}} \times 100$$

This is apparent BV

$$\% \text{ BV} = \frac{\text{NI} - (\text{FN} - \text{MFN}) - (\text{UN} - \text{EUN})}{\text{NI} - (\text{FN} - \text{MFN})} \times 100$$

This is True BV

## 2. Net Protein utilization (NPU):

- Usefulness of a protein will depend upon its digestibility as well as its biological value.
- The products of these two values is the proportion of the nitrogen intake which is retained and is termed as “Net protein utilization”

$$\text{NPU} = \frac{\text{(Digestibility coefficient X Biological Value)}}{100}$$



### 3. Protein Replacement value (PRV):

- This value measures the extent to which a test protein will give the same balance as an equal amount of a standard protein.
- Two nitrogen balance determinations are carried out, one for a standard such as egg or milk protein, which is of high quality, and one for the test protein.
- The PRV is calculated as follows:

$$\text{PRV (\%)} = 100 - \left[ \frac{(\text{NBS} - \text{NBT})}{\text{NI}} \times 100 \right]$$

NBS- nitrogen balance of standard protein; NBT- Nitrogen balance of test protein

- Eg. Two rations one having standard protein i.e. egg and second is having test protein i.e. soyabean meal NB1 is 20 and NB2 is 16 nitrogen intake is kept as 50g

# BODY NITROGEN RETENTION METHOD

- Miller and Bender (1955)
- This is based on a comparison of the body N content resulting from a test protein with that resulting over the same period on a nitrogen free diet.

$$\text{Body Nitrogen retention} = \frac{\text{Body N content with test} - \text{Body N content with N free diet}}{\text{Nitrogen Intake}}$$

- Experiments on rats

# CHEMICAL EVALUATION OF PROTEIN FROM AA COMPOSITION

## 1. Chemical score:

- Black and Mitchell (1946)
- Through this protein quality is decided by that amino acid which is in great deficit when compared with standard.
- Most deficit amino acid is known as “limiting amino acid”
- The lysine content of egg and wheat protein is 72 and 27g/kg DM respectively, and the chemical score for wheat protein is  $27/72=0.37$ .
- Chemical score of wheat is 37%

## 2. Essential amino acid index:

- B.L.Oser (1951)
- It analyze by using all the essential amino acid rather than using only the deficit one.
- It is defined as the geometric mean of the ratios comparing ten EAA's in a feed protein with that found in whole egg protein

$$\text{EAAI} = 10 \sqrt{\frac{100a}{a_e} \times \frac{100b}{b_e} \times \frac{100c}{c_e} \dots \dots \dots}$$

- a, b, c.....= % conc. Of amino acid in feed protein
- ae, be, ce.....= % conc. Of same amino acids in egg protein