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Lecture title: **Animal nutrition: evaluation of protein quality for farm animals**

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Summary:

Evaluation of protein quality for farm animals

Metabolism : sequence of chemical reactions that take place in living organisms. It involves both the synthesis (anabolism) and breakdown (catabolism) of complex compounds.

Crude Protein

Most of the nitrogen required by the animal is used for protein synthesis. Most of the food nitrogen is also present as protein. Chemically, the protein content of a food is calculated from its nitrogen content determined by a modification of the classical Kjeldahl technique. All the nitrogen of the food is present as protein; and all food protein contains 160 g N/kg.The nitrogen content of the food is then expressed in terms of crude protein (CP):
CP (g/kg) = g N/kg * 6.25

Digestible Crude Protein

The crude protein figure provides a measure of the nitrogen present in the food but gives little indication of its value to the animal. Before the food becomes available to the animal, the food must undergo digestion, during which it is broken down to simpler substances that are absorbed into the body.The digestible protein in a food may be determined by digestibility trials in which nitrogen intake is measured along with the nitrogen voided in the feces. the difference between the quantities of nitrogen in the food and feces represents the quantity absorbed in a utilizable form by the body and that all nitrogen that appears in the feces is of dietary origin. Endogenous nitrogen may be divided into two fractions: that which is unrelated to the quality and the quantity of the dietary protein and is dependent only upon the quantity of dry matter passing through the gut and termed basal nitrogen loss (BN), and that which is related to the quality and quantity of the dietary protein and other ingredient characteristics such as fibre or anti-nutritional factors, and termed specific endogenous nitrogen (SN).

methods for evaluating proteins in mono-gastric animals.

It is a method for evaluating proteins in mono gastric animals such as:

- the protein efficiency ratio (PER) which is defined as the gain in body weight per gram of dietary protein or N consumed.

$$PER = \frac{\text{gain in body weight (g)}}{\text{protein consumed (g)}}$$

- the net protein ratio (NPR) with the consideration of maintenance requirement by the animal.
- the gross protein value (GPV), which are based on the growth response of animals to the protein.
- slope ratio (also called the nitrogen growth index), which means the slope of the regression of weight gain [Y-axis] on dietary N intake [X-axis])

Biological value

This is a direct measure of the proportion of the food protein that can be utilized by the animal for synthesizing body tissues and compounds and may be defined as the fraction of absorbed N retained in the body for maintenance and growth of the animal.

$$B.V. = \frac{\text{N intake - (fecal N - MFN) - (urinaryN - EUN)}}{\text{N intake - (fecal N - MFN)}}$$

MFN = metabolic (endogenous) fecal nitrogen and
EUN = endogenous urinary nitrogen.

Measures Of Protein Quality For Ruminant Animals

In evaluating protein sources for ruminant animals, account must be taken of:

1. the degradability of the protein within the rumen.
2. the rate of passage of the food through the rumen
3. the efficiency of capture of degraded protein by the rumen microbes
4. the yield of microbial protein
5. the true digestibility of the protein reaching the small intestine.
6. the efficiency of utilization of nitrogen absorbed from the small intestine.

Ruminal undegradable protein (RUP)

Refer to the portion of dietary protein which is not degraded by rumen microbes.

Ruminal bypass protein (RBP)

Refers to the proportion of dietary protein that evades microbial attack and bypass the rumen through mixing with ruminal content.

Sources of protein

RDP ——soyabean meals (48% , 45%) characterized by high Palatability
——- oil seed meals

RUP —— **plant**. for e.g. heated oil seeds meal and oil seeds meal
Characterized by less palatability

—— **animal** for e.g meat ,bone meal ,fish meal.
Characterized by less palatability.