Proteins

For food to be used with maximum efficiency, the animal must receive sufficient quantities of both the essential and non-essential amino acids to meet its metabolic demands. Simple-stomached animals such as Horses , pigs and poultry obtain these acids from the breakdown of food proteins during digestion and absorption. In the case of ruminant animals, the situation is more complex.

Considerable degradation and synthesis of protein occur in the rumen, and the material that finally becomes available for digestion by the animal may differ considerably from that originally present in the food. Different approaches to the evaluation of protein sources are therefore necessary for ruminant and non-ruminant animals.

Digestibility

Proteins, like any other nutrients, are not completely digested and absorbed

$$Apperent\ Digestibility = \frac{\text{Feed protein} - \text{Fecal protein}}{\text{Feed protein}}\ x\ 100$$

1) An assumption? - .All proteins in the feces are derived from undigested feed residues (i.e., from an exogenous source)..
2) But, the fecal protein consists of enzymes, cellular materials & others that are not reabsorbed (i.e., contains protein from endogenous sources), thus underestimate digestibility!

$$True\ Digestibility = \frac{\text{Feed N} - (\text{Fecal N} - \text{Metabolic fecal N})}{\text{Feed N}}\ x\ 100$$

Structural and Physiological Roles of Proteins in Animals:

Buffering such as Hemoglobin and myoglobin

Cell and tissue structures such as Collagen, elastin, keratin, mucins,

Colloidal properties such as Proteins in plasma (albumin and globulins) and gelatin

Enzyme-catalyzed reactions such as Decarboxylase, dehydrogenase, lipases, proteases

Gene expression such as DNA-binding proteins, histones.

Hormone-mediated effects such as insulin, LH, placental lactogen, somatotropin,

Muscle contraction such as Actin, myosin, tropomyosin, troponin.

Protection such as Blood clotting factors, immunoglobulins, interferon

Regulation of cell signaling such as leptin, osteopontin.w

Storage of nutrients and O2 such as ferritin, metallothionein, myoglobin,

Transport of nutrients and O2 such as Albumin, hemoglobin, plasma lipoproteins.

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, and it is convenient and almost universal for the nitrogen requirements of animals and the nitrogen status of foods to be stated in terms of protein. Chemically, the protein content of a food is calculated from its nitrogen content determined by a modification of the classical Kjeldahl technique or the Dumas method; this gives a figure that includes most forms of nitrogen, although nitrites, nitrates and certain cyclic nitrogen compounds require special techniques for their recovery. Two assumptions are made in calculating the protein content from that of nitrogen: first, that all the nitrogen of the food is present as protein; and second, that 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 * 1000/160

Conjugated proteins

Some important examples of conjugated proteins are:

1. Glycoproteins
2. Lipoproteins
3. phosphoproteins
4. chromoproteins.

Glycoproteins are components which act as lubricants in many parts of the body.
Lipoproteins, which are proteins conjugated with lipids such as triacylglycerols and cholesterol, are the main components of cell membranes and are also the form in which lipids are transported in the bloodstream to tissues, either for oxidation or for energy storage.
Phosphoproteins it's include the caseins of milk and phosvitin in egg yolk.
Chromoproteins Examples are haemoglobin and cytochromes, in flavoproteins, which contain flavins