Digestion of proteins:

In non-ruminants, some digestion of dietary protein starts in the stomach and most digestion occurs in the small intestine. Events of this process include: (1) denaturing of dietary protein and activation of zymogens by gastric acid in the stomach, followed by local digestion with active gastric proteases to form large peptides; and (2) hydrolysis of the large peptides and the undigested proteins in the small intestine by the pancreas- and enterocyte-derived proteases. The protein digestion products are absorbed into the enterocytes via AA and peptide transporters.
The digestibility of dietary protein is affected by:

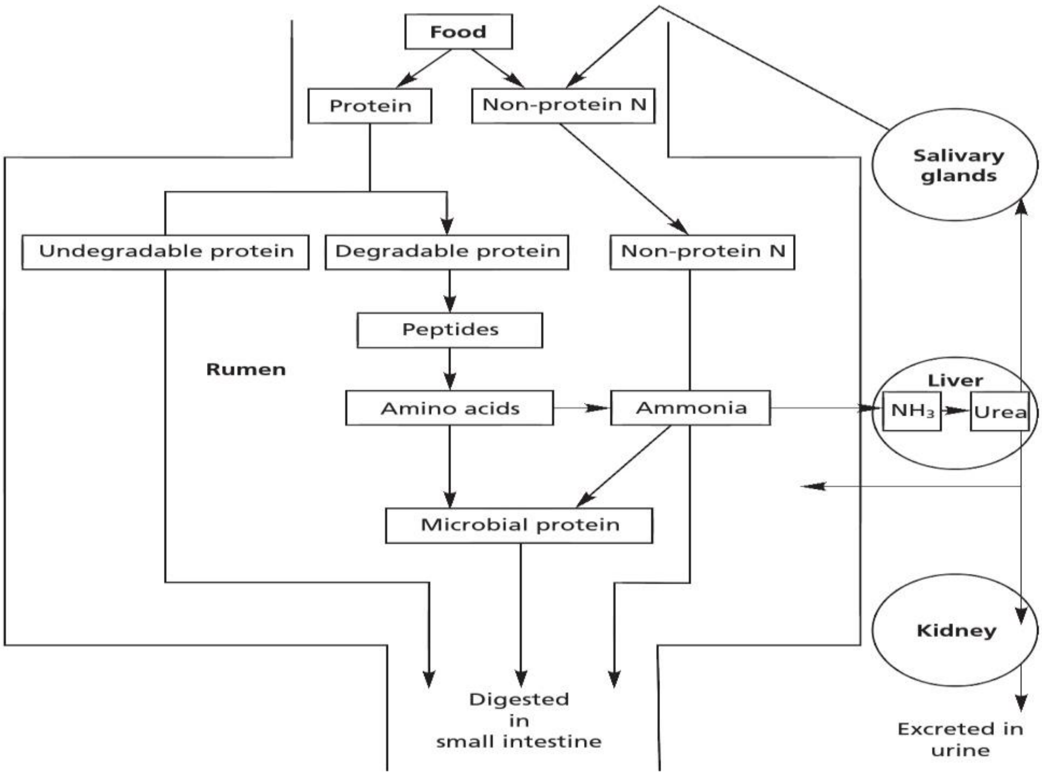
- **Biological** (e.g., species and strains of animals, physiological status, and individual variations),
- **Environmental** (e.g., ambient temperatures, pollution, and noise),
- **Dietary factors** (e.g., the form, odor, texture, and particle size of feed)

Food protein was hydrolyzed to simple units called peptides and amino acid by rumen flora, some of these amino acids was degraded to organic acids and NH_3 accompanied by CO_2. For example:
Deamination of valine is produced isobutyric acid by the aid of rumen flora, the ammonia and small peptides and free amino acids can by utilized by rumen micro flora to synthesize microbial proteins, some of these microbial proteins will breakdown and its nitrogen is recycled. the greater part of protein will be microbial protein and pass to small intestine. The lesser part will be undegraded protein.

Digestion and metabolism of nitrogenous compounds in the rumen:
The concentration of ammonia will be low in rumen reach to about 50 mg/l if:

- the diet is difficient in protein.
- the protein resist degradation

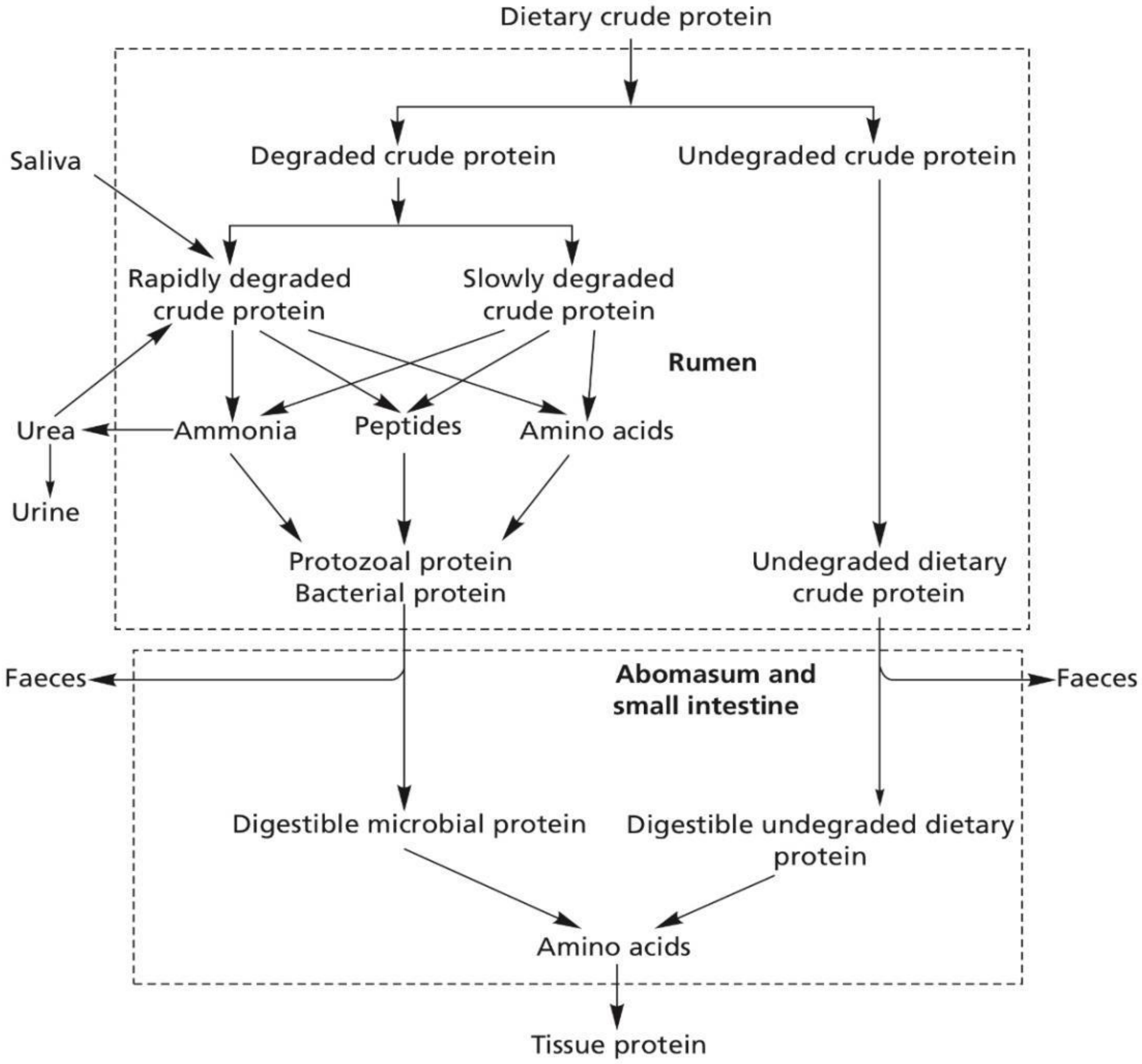
As a result of these changes the growth of rumen micro flora will be slow, and the breakdown of carbohydrates will be retarded.
In the other hand the ammonia will accumulate in rumen liqour (optimum concentration) if protein degradation more than the synthesis in this case the ammonia will absorbed into blood stream and then to the liver where it converted to urea, the greater part will excrete in urine but some of urea may be returned back to the rumen via saliva.
The following diagram digestion and metabolism of nitrogenous compounds in rumen



The optimum concentration of ammonia in rumen liquor varies from 85 mg/l - 300mg / l. This recycled nitrogen is converted to microbial protein and the ruminant is able to conserve nitrogen by returning to the rumen urea .Each kilogram of organic matter digested in rumen yield approximately 200 gm of microbial protein , some rapidly fermented food such as immature forages rich in soluble carbohydrates yield more microbial protein up to 260 gm / kg of digested organic matter.Silage contain nutrients partly fermented , one of the major products of silage fermentation is the lactic acid and the yield of rumen microbial protein / unit of organic matter is lower compared with other foods .

Rumen microflora also have the ability to convert non protein nitrogenous compounds NPN to protein by adding some substances to diet and the most commonly one is the urea which is rapidly hydrolyzed to ammonia by the presence of uricase enzyme with the aid of rumen flora but it is important to avoid over consumption of urea in forages because the absorption of ammonia from rumen will be over the ability of liver to convert it to urea as a result this will cause increase ammonia concentration in blood lead to high toxic levels .Biuret is less rapidly hydrolyzed required several weeks for rumen microorganisms to adapted to it .IBDU isobutylidene diurea , additional NPN utilized by rumen bacteria is Uric acid which increase in poultry excreta . Protein synthesis requires activation of amino acids, initiation of peptide chain formation, chain elongation and termination, all of which have an energy cost.

The following diagram refer the fate of dietary crude proteins in ruminant animals:



Degradability of the nitrogen fraction of the diet

Nitrogen fractions within the diet will vary in their susceptibility to breakdown, from immediately degraded to undegradable , and from 0 to 1 in the extent to which they are degraded in the rumen and digested when they reach the small intestine.

Degradability will be affected by such factors as the surface area available for microbial attack and the protective action of other constituents as well as the physical and chemical nature of the protein. Claims have been made that the solubility of a protein is correlated with ease of breakdown, but these do not survive critical examination. Thus, casein, which is readily degraded in the rumen, is not readily soluble; whereas albumin, which is resistant to breakdown, is readily soluble. It has been suggested that a major factor affecting degradability is the amino acid sequence within the protein molecule. If this is so, then the nature of the microbially produced rumen peptidases is of considerable importance and it seems doubtful whether any simple laboratory test for degradability is possible.

The extent to which a nitrogen fraction is degraded in the rumen will depend upon its innate degradability and the time it spends in the rumen, i.e. rate of passage. As the rate of passage increases, so the extent of ruminal breakdown is reduced.