

Ruminant Glossary - Proteins

Protein - complex compounds containing carbon, hydrogen, oxygen, nitrogen and usually sulphur are composed of one or more chains of amino acids. Proteins are essential in the diet of animals for growth, lactation and reproduction. In ruminants (for example, cattle), the rumen microbes break down about 80 per cent of the protein in the feed to ammonia, carbon dioxide, volatile fatty acids and other carbon compounds. The microbes then use the ammonia to synthesise their own body protein. As feed is passed through the rumen into the rest of the digestive tract, the micro-organisms containing about 65 per cent high quality protein are washed along too. The ruminant obtains most of its required protein by digesting these micro-organisms.

Soluble Protein - estimates the amount of crude protein that will readily dissolve when the feed enters the rumen. This protein fraction represents the portion of crude protein that is rapidly degraded or digested by rumen microbes. Higher soluble protein levels are often found in silages that are put up very wet (less than 30% dry matter).

Rumen Degradable Protein (RDP) - that portion of the consumed protein digested in the rumen. It may also be referred to as **degradable intake protein (DIP)**

Undegradable Intake Protein (UIP) - is also called **bypass** protein or **escaped** protein or **rumen undegradable protein (RUP)**. It is the portion of intake protein that escapes rumen degradation and is digested directly in the small intestine. About 80 to 85 per cent of the microbial bacterial protein and UIP or true protein that flows out of the rumen is digested in the small intestine. UIP is expressed as a percentage of crude protein (CP).

Nitrate per cent (NO₃%) - nitrate is also part of the nitrogen-containing feed fraction; however, it contributes very little to the crude protein percentage. Nitrates can accumulate in a crop that has been subjected to drought, hail, frost or high levels of nitrogen fertilisation. Feeds containing high levels of nitrate (greater than 1 per cent) can be toxic to the ruminant.

Non-protein Nitrogen (NPN) - nitrogen that comes from other than organic protein sources (e.g. plant or animal) that can be used by ruminants to make animal protein. NPN sources are compounds like urea and ammonia

Metabolisable Protein (MP) - metabolisable protein is protein (amino acids) that is actually absorbed from the gut. MP consists of protein in the rumen micro-organisms, feed protein and any protein that bypasses digestion in the rumen undegradable intake protein (UIP). The concept of protein degradability has led to a new protein system called the metabolisable protein (MP) system. In this system, you balance to meet the requirements of the microbes and the animal,

paying attention to the DIP and UIP fractions of the feed.

Mg/kg - units of concentration, for example, milligrams in a kilogram. This measure is the same as parts per million (ppm) because 1 kilogram is 1 million milligrams. For example $10 \text{ mg/kg} = 10 \text{ ppm}$.

Escape Protein - see By-pass Protein or Undegradable Intake Protein.

Digestible Protein (DCP) - the amount of crude protein (CP) actually absorbed by the animal (crude protein minus the protein lost in faeces).

By-pass Protein - refers to the portion of intake protein in a feed that is not broken down in the rumen but is digested directly in the small intestine. By-pass protein is another name for undegradable intake protein (UIP), rumen undegradable protein (RUP) or escape protein.

Acid Detergent Insoluble Nitrogen (ADIN) - a measure of the nitrogen remaining in the acid detergent fibre residue of a feed sample. While some ADIN occurs naturally in all plant material, it is usually considered to be an indicator of heat damage that can occur during storage or processing. Excessive heating of forages and grains causes some of the nitrogen to become irreversibly bound in the fibre. Nitrogen in excessively heated samples is usually indigestible or poorly digested by rumen microbes. It has been estimated that as much as 70 per cent of the protein bound with the fibre is unavailable to the animal. Feed labs may report acid detergent fibre protein (ADF-P%) or acid detergent insoluble protein (ADIP% or ADICP%), which can be expressed as a per cent of total dry matter or as a percentage of total nitrogen/protein.

The concentration of ADIN is used to determine protein availability in heated feeds. Estimates of crude protein (CP) available to the animal can be adjusted by using the following guideline. If ADIN levels are below or equal to 10 per cent, the crude protein level does not require adjustment, as these levels represent naturally occurring ADIN: for example, $\text{CP}\% = 10\%$ and $\text{ADIN} = 10\%$, then $\text{CP}\% = 10\%$. If reported ADIN is above 10%, then subtract 10% from the ADIN value and use the difference to adjust the crude protein available: for example, if $\text{ADIN} = 20\%$, then $20 - 10 = 10\%$ ADIN; $10\% \text{ CP} \times (10/100) = 1$, so $10\% \text{ CP} - 1\% = 9\%$ CP available.

Acid Detergent Insoluble Protein (ADIP) or acid detergent insoluble crude protein (ADICP) - is the insoluble protein fraction, which is unavailable to the animal due to heat damage. It is expressed as a per cent of total protein. ADIP% may be reported as acid detergent insoluble nitrogen (ADIN %) or acid detergent fibre protein (ADF-P%).

Source [http://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/agdex4521](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex4521)