Fact Sheet
Milk Urea Nitrogen (MUN)

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Milk Urea Nitrogen (MUN) is a nitrogen compound in milk that is related to the amount of urea circulating in the blood and affected by the amount of protein eaten by the animal.

In pasture-based systems, MUN levels are usually higher than in systems where cows are fed a total mixed ration or a high level of concentrates. This is due to the greater amount of crude protein (20-25 %) in good quality pasture.

High MUN concentrations are not detrimental to cow health or fertility in pasture-based cows. Depending on the stage of lactation, MUN levels less than 20-25 mg/d can indicate insufficient protein in the cows' diet; in these situations, dietary protein levels and amino acid composition should be checked against cow requirements.

For high-input systems (e.g. less than 60% of the diet is pasture), MUN levels can help decide when to check the diet for an excess or deficiency of protein. If protein is in excess of recommended levels, this can allow expensive protein supplements to be removed from the diet.

In low-input systems, it is not beneficial to the animal to try and reduce MUN. In high-input systems, high MUN can indicate that protein supplements could be reduced in the diet. For all systems, low MUN can indicate dietary protein deficiency.

1. WHAT IS MILK UREA?

Milk Urea Nitrogen (MUN) is a by-product of the breakdown of dietary protein. It is formed from normal daily metabolism of nitrogen and protein.

The digestion of nitrogen and protein in the rumen releases ammonia. If a diet has excess rumen degradable protein, excess ammonia is produced. The excess ammonia is absorbed through the rumen wall into the blood stream and converted to urea in the liver. Excess protein digested in the small intestine goes through a similar fate, being converted in the liver to urea. Most of the urea is excreted in the cow's urine (see point 5) although some passes into the milk.

The main factor affecting MUN in pasture-based systems is the amount of protein in the diet although, there are other factors that also influence MUN.

A high MU concentration in pasture-based dairy cows does not affect their health or reproductive performance.

2. INTERPRETING MUN

Milk Urea Nitrogen is an approximate indicator of the dietary protein supply to the cow.

Lower-input systems (where pasture makes up more than 60% of the diet) can often have MUN greater than 30 mg/dl and, there is no benefit to the animal to try and lower MUN concentrations.

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MUN may be used as a tool to help identify when dietary crude protein levels should be checked.

Depending on the stage of lactation, MUN concentrations below approximately 20 - 25 mg/dl can indicate that protein may be limiting milk production; however, if MUN is greater than approximately 30 mg/dl the cow is not deficient in metabolisable protein, and high protein feeds are unlikely to increase milk production.

As there are other factors influencing MUN, actual MUN concentrations are less important than establishing the normal base-line MUN for your farm and monitoring changes in association with feed changes (e.g. MUN could help you to decide when to check dietary crude protein content and alter the use of protein supplements).

3. PROTEIN REQUIREMENTS (CP%) & ASSOCIATED MILK UREA VALUES

The dietary protein requirements and the associated approximate MUN values are in Table 1 below.

If the MUN value of the herd average is less than the indicated range, farmers should look at the protein and amino acid content of the diet offered to their cows, as total protein or a particular amino acid may be limiting production.

If this is the case, options such as increasing the proportion of pasture in the diet or adding in appropriate protein supplements could be considered. Farm infrastructure should be an important consideration in this decision, as protein supplements tend to be very expensive, and it is important to minimise wastage.

If the MUN values are greater than the indicated range, it could indicate excess protein in the diet. In pasture-based systems high MUN values are not detrimental to animal health or reproduction; however, they can indicate when to check dietary protein levels and potentially reduce the use of expensive protein supplements.

	Early lactation	Mid lactation	Late lactation
Minimum CP% in diet	18	16	14
Estimated MU value (mg/dl)	25-40	25-30	20-25

Table 1: Protein requirements of lactating dairy cows and estimated approximate MUN values.

4. ENVIRONMENT

Although MUN values are associated with the concentration of urinary N, implications of small changes in the urinary N concentration on environmental N loading are minor compared with other management factors, such as stocking rate and/or days in milk. Numerous management and resource factors determine the environmental outcome on farm, and the impact of any change needs to be determined by taking into account the whole farm system.

For example, the addition of supplements to increase stocking rate or days in milk, may reduce MUN but could actually lead to increased N leaching.

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