

# Evaluation of the use of Milk Urea Nitrogen (Mun) as an Indicator of Nutritional Status of Dairy Cattle in Smallholder Farms in Kiambu District

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## Abstract

A survey was conducted to evaluate the use of Milk Urea Nitrogen as an indicator of nutrition status of lactating animals. Twenty-seven animals in a randomly selected sample of 21 farms in Kiambu District were monitored for nutritional status for 12 weeks. Fortnightly records were taken on feed offered, body condition, body weight and milk yield. Milk samples were collected weekly and analysed for MUN. Preliminary results indicated that there was a significant ( $P < 0.05$ ) negative correlation between MUN and milk yield, and a marginal correlation between MUN and body weight. There was no significant relationship between MUN and Body condition score.

The data so far collected, which excludes the feed data indicate that MUN, may be a reliable indicator to an extent, of nutritional status of dairy cattle under smallholder farm conditions.

## Introduction

Improved feed supply and utilisation leads to better nutritional status of cows and an improvement in performance (Mdoe and Mlay, 1988). Energy and protein are of paramount importance in dairy cattle nutrition. Expressed as digestible organic matter:crude protein (DOM:CP) the optimum ratio is about 7:1 (Moore *et al.*, 1995). Under conditions where forage composition and precise intake are unknown, a metabolic indicator of the protein and energy status could be helpful as a measure for nutritional status in cattle. However, this is used as an adjunct to other measures such as body weight and body condition score that reflect the integrated effects of nutrition over time (Hammond and Chase, 1995). An example of such an indicator is urea nitrogen. Protein digestion in ruminant results with unused ruminal ammonia being transported to the liver via the portal blood where it is converted to urea and then circulates in the blood. This urea may diffuse from the blood into milk in the case of lactating females. In healthy ruminants BUN and MUN concentrations (which are highly correlated) are indicative of the energy to protein (i.e. DOM:CP) ra-

tio in the diet (Roseler, *et al.*, 1993; Baker, *et al.*, 1995).

Balanced diets for lactating cows were associated with average MUN concentrations of 15 to 16 mg/dl (Baker *et al.*, 1995). Although MUN concentrations may be affected by factors such as increased protein intake and/or solubility and degradability which result in high concentration (Roseler *et al.*, 1993; Baker *et al.*, 1995; Kirchgessner, *et al.*, 1996) and increased energy intake which results in low concentration it could still be helpful in making nutritional management decisions. Use of milk has an advantage in that unlike most metabolic screening approaches, which involve blood sampling, milk samples can be obtained noninvasively and conveniently at the time of milking. This work related MUN, milk yield, Body weight and Body condition.

## Materials and Methods

Twenty-one randomly selected farms in Kiambu district were studied for 12 weeks. Milk samples were collected on a weekly basis from 27 lactating cows and analysed for MUN using the Urease Berthelot method (kit supplied by 'HUMAN' diagnostics). Fortnightly records were taken of the daily milk yield per animal, body weight and condition. Body condition was scored using the five-point scoring system based on the method of the National Institute for Research in Dairying, U.K. The heart-girth measurements were used to estimate the body weight. Descriptive statistics and correlation between the three parameters were calculated.

## Results

The milk yields for the lactating cows (27) averaged  $6 \pm 0.2$  kg, condition score  $2 \pm 0.05$ , body weight  $317.3 \pm 3.7$  kg and MUN averaged  $17.1 \pm$

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0.4 (Table 1). Milk Urea Nitrogen had a significant ( $P < 0.05$ ) negative correlation with milk yield and a marginally significant ( $P = 0.052$ ) correlation with body weight. Correlation between MUN and body condition was low ( $P > 0.05$ ) and negative (Table 2).

**Table 1 Means of the different variables measured on 27 lactating cows.**

Variable	Mean	SD
MUN	17.1	5.19
Milk Yield	6.1	3.55
Body Condition	2	0.62
Body Weight	317.3	46.13

**Table 2 Correlation between MUN and Milk yield, Body condition and Body weight**

	Milk Yield Score	Body Condition weight	Body
Correlation coefficient	-0.23	-0.09	-0.16
P value	0.0063*	0.5943	0.052*

- - Significant at 95% level of confidence

## Discussion

The average milk yield was below the average for exotic cows (15kg/day/cow). Studies conducted by Staal, *et al.*, (1996) in Kiambu district showed average milk production of 4-12kg/cow/day, which is below the potential of 15-20kg/cow/day. One of the reasons attributed to this was that the animals' feed requirement was not met. The cows in the study showed some degree of stunting since their average weight (317kg) was below what is expected (400kg). Weights for the same animals taken recently using an electronic weighing scale reported average body weight of 335kg which is lower than 436kg reported by a commercial farm and 404kg by the University farm. Body condition score and live weight have been shown to have an imperfect positive relationship, which is affected by pregnancy and age. Cows calving down in condition score 3.5 showed the highest yields (Min. Agric. U.K., 1978). Most of the animals in this study were in poor body condition. This may explain the low average milk yield.

In studies conducted by Kirchgessner *et al.*, (1986), energy restriction resulted in average depression in milk production of 14% while protein restriction resulted in 10-11% reduction. Excess dietary protein resulted in 2% reduction in yield. In the same study, energy restriction produced significantly higher urea content ( $27.9 \pm 3.0$  mg/dl) than the control group ( $20.6 \pm 2.6$  mg/dl). Protein restriction resulted in lower MUN ( $8.7 \pm 1.0$  mg/dl) than the control group ( $17.6 \pm 0.2$  mg/dl). These reports indicate a negative correlation between MUN and milk yield.

The range of MUN in this study indicate that an imbalance in the diets of the dairy cows could be suspected since there were MUN concentrations outside the balance range obtained in various studies. However it is difficult to conclude at this stage before data on feed intake and composition is analysed. Previous studies in Kiambu District (Staal *et al.*, 1996) suggest that animals may suffer both energy and protein deficiency. Since it is not easy to collect feeding data under farm conditions, MUN may be used to investigate energy-protein imbalance in lactating dairy cattle.

## References

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