# Monitoring Protein Utilization by Use of Milk Urea Nitrogen

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## INTRODUCTION

The increase in number and production of livestock also introduced a considerable nutrient surplus in livestock systems. Because of the negative effects on the environment, the sustainability of the system on national, regional, or farm levels has become one of the key items in animal production. The concept of sustainability is not well defined. Usually the opposite, lack of sustainability, is used to illustrate the aim of sustainability. The main indicator of the imbalance in a system is the nutrient balance. Therefore, the monitoring of nutrient flow on farm and at animal levels has been given much attention, especially that of nitrogen, phosphorus and potassium.

The external input of these nutrients on dairy farms is primarily from artificial fertilizers for the production of high yields and quality roughage, and from compound feeds necessary to sustain high milk production. Ten years ago the average input of N was about 550 kg per ha in the Netherlands, of which 60% came from artificial fertilizer. The net nitrogen output as product was only 14% of the input, mainly as milk protein. The phosphorus input in these years was almost 50 kg per ha, of which only 31% left the farm as animal end product (Van Keulen et al., 1996).

In several countries legislation is foreseen to limit the mineral surplus in animal production. That development forces the farmer to evaluate thoroughly the mineral flows on their farms and in the animals. The main tools for them to avoid mineral, and in cattle especially nitrogen losses, are: reduce the amount of artificial fertilizer, decrease the ammonia emission from the stable, and fine tune the balance between the protein and energy intake by the cows. For monitoring the last aspect, representative and easily measurable parameters are of great practical value for the farmer. Urea excretion has the potential to serve as a biological tool to monitor nitrogen losses in dairy cows.

## PROTEIN INTAKE AND UREA EXCRETION

Erbersdobler & Zucker (1980) and Oltner & Wiktorsson (1983) already demonstrated, that a surplus of protein intake increases urea content in the blood (**BUN**). And because urea can easily pass from the blood into the milk, there is a close relationship between BUN and the urea level in milk **(MUN)**. Recently Meijer et al. (1996) estimated from data of circa 180 dairy cows a correlation between BUN and MUN of 0.96. The correlation between total urea excretion in urine with the urea content in blood or milk was 0.88 and 0.77, respectively. BUN or MUN is less suited to predict urea content in the urine, because urine volume increases with nitrogen excretion (Van Vuuren et al., 1996a).

The results demonstrate that BUN and MUN represent the urea pool in the body and urea excretion and may, therefore, have the potential to serve as a parameter for the nitrogen losses in dairy cows. As sampling of milk is much easier than that from blood, MUN may serve the purpose best in practice. However, in most research to evaluate the potential of MUN for this purpose, the nitrogen losses were estimated from crude protein (**CP**) or digestible crude protein (**DCP**) intake. Meanwhile, new systems to quantify the protein value of feeds were introduced. They are based on the rumen degradability of protein and energy, the absorption of amino acids from the intestine, and their utilization in the metabolism (Anonymous, 1985; and Tamminga et al., 1994). Thus, they provide basically the opportunity to monitor protein intake in relation to reduced nitrogen losses. However, feed evaluation is based on average relationships between feed composition and its utilization by the animal. The actual utilization may differ, dependent upon the situation in practice. Additional information, e.g., from MUN may therefore be helpful. However, little is known as to what extent MUN represents the nitrogen flows and losses as they are distinguished in the modern evaluation systems. Moreover, it is not