How Efficiently Are Your Cows Using Ration Nitrogen?

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Disclaimer
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USDA United States Department of Agriculture

NRCS Natural Resources Conservation Service

Introduction

This fact sheet has been developed to support the implementation of the Natural Resources Conservation Service Feed Management 592 Practice Standard. The Feed Management 592 Practice Standard was adopted by NRCS in 2003 as another tool to assist with addressing resource concerns on livestock and poultry operations. Feed management can assist with reducing the import of nutrients to the farm and reduce the excretion of nutrients in manure.

The Natural Resources Conservation Service has adopted a practice standard called Feed Management (592) and is defined as “managing the quantity of available nutrients fed to livestock and poultry for their intended purpose”. The national version of the practice standard can be found in a companion fact sheet entitled “An Introduction to Natural Resources Feed Management Practice Standard 592”. Please check in your own state for a state-specific version of the standard.

Protein is typically the most expensive purchased component in dairy rations. Protein is composed of a number of nitrogen (N) sources. The goal in feeding dairy cattle is to develop feeding programs and management systems that maximize the efficiency of N use and decrease N excretion to the environment. This provides an opportunity to increase both profitability and environmental stewardship.

How can you determine the efficiency of N use in your herd? There are a couple of methods that can be used to do this on your farm. One is to monitor the milk urea nitrogen (MUN) levels. High MUN levels indicate a lower efficiency of N use in the animal. A separate fact sheet contains more information and guidelines for using MUN as part of your feeding management system.

A second way is to calculate the quantity of the feed N consumed that ends up in milk. Milk nitrogen efficiency (MNE) is a term that can be used to quantify this relationship. A higher MNE value indicates that more of the feed N consumed was captured in the milk. This also indicates that N excretion to the environment was reduced.

What are the ranges observed for MNE? This question was examined using two sets of data. One was from published research trials and consisted of 334 rations from 62 different research trials (Chase, 2003). The rations fed in these studies ranged from10.2 to 24.6% CP. A second set was 83 rations from 49 commercial dairy herds. Results from this evaluation were:

- Research data – The average MNE was 27% with a range from 16.2 to 45.2%. Most of the high MNE values in this data set were from cows fed low CP rations that may have been slightly protein deficient.

- Commercial dairy farm data – The average MNE is these herds was 28.7% with a range of 21 to 36%. The rations fed in these herds ranged between 15 and 20% CP. Greater than 80% of the commercial herds had a MNE value between 25 and 35%. One caution with the commercial farm data is that the dry matter intake used in the calculations was from the ration formulation sheets provided by the farm, consultant or feed company. Actual observed farm intakes may have been different which would change the MNE value.

What can you do to improve your herd's MNE value? The following items should help with this:

- Use routine forage testing.

- Use on-farm silage dry matter determinations to adjust the quantity of forages added to the ration.

- Track group or herd dry matter intakes. This requires accurate pen counts and also adjusting the quantity of feed fed for refusals.

- Use MUN values as another index of the efficiency of N use in your herd. A number of milk cooperatives provide this data on every load of milk shipped. This is a bulk tank MUN value. You may also want to have individual cow MUN's run.

- Work with your feed professional to evaluate your current rations and feed management practices to see if opportunities exist for improving MNE. Special attention should be given to the balance of rumen degradable (RDP) and rumen undegradable (RUP) protein. Make sure that adequate quantities of RDP are available to support

microbial protein production in the rumen. Ration non-fiber carbohydrate (NFC) levels should be examined to make sure that adequate rumen fermentable carbohydrate is available to support the conversion of ammonia in the rumen to microbial protein.

- Evaluate or reformulate your ration using programs that look at metabolizable protein (MP) and amino acid balance. Lysine and methionine are the two amino acids to evaluate at this time.

Summary:

Milk nitrogen efficiency provides a method to assess the efficiency of feed N use in your herd. Higher MNE values indicate better efficiency in convert feed N into milk N. These higher MNE values also indicate that less of the feed N is being excreted into the environment in the manure. Profitability, measured as income over feed cost, should also be improved since you are getting better use of your feed dollar.

Reference:

Chase, L.E. 2003. Nitrogen utilization in dairy cows – what are the limits of efficiency? Proc. Cornell Nutr. Conf., Syracuse, NY. pp: 233-244.

How can I calculate the MNE value for my herd? Table 1 provides a worksheet that can be used to do this. The following guidelines can be used to interpret the results of this calculation:

MNE, %	Comment
< 20%	This indicates a very low efficiency of N use and a high level of N excretion to the environment.
20 – 25%	Better. There are opportunities to improve the efficiency of N use.
25 – 30%	Similar to the averages observed in both the research and commercial herd data. You should evaluate ration adjustments to increase MNE
30 – 35%	Great! There may still be some opportunities for improvement.
> 35%	Super! Make sure that this is not the result of low CP rations that may be slightly deficient or have lowered milk production.

Table 1. Milk Nitrogen Efficiency Worksheet

	Your Herd	Example
a. Ration dry matter intake, lbs/day		55
b. Ration crude protein, % of total dry matter		17
c. Milk production, lbs/cow/day		85
d. Milk total protein, % (If milk true protein data is available, multiply by 1.08 to get total protein)		3.2
e. Crude protein fed/cow/day,lbs (a*b/100)		9.35
f. Crude protein in milk, lbs. (c*d/100)		2.72
g. Daily feed N intake, lbs. (e/6.25)		1.5
h. Daily milk N output, lbs. (f/6.38)		0.43
MNE,% = (h/g)*100		28.7

Project Information

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