GRI CONCEPTS

THE CUTTING EDGE OF NUTRITION

The Bulletin for Alumni of the Beef Cattle Nutrition School

September 1995

Degradable Protein

Your comments suggest that clarification of the degradable protein concept, presented in the School, is in order. Further, we have tweaked the equation for determining the degradable protein requirements. Therefore, we will devote this space to reviewing and upgrading your calculations.

Microbial Requirements

A relationship between dietary degradable protein and fermentable energy exists for the optimal utilization of both. This ideal situation of complementary levels of plant nutrients recently was addressed in a literature review by two Australian scientists[a]. The authors suggested a unity value of 0.05718 lb. of degradable protein to one Mcal of NE_m.

We use the value of 0.07 lb. of degradable protein to one Mcal of NE_m. [*Your notes should reflect this change to the equation in the section on Degradable Protein*:

(Deg Pro Requir (lb) = 0.07 × NEm Consump.)]

This is a bit higher than the Australians' value. The data used to establish their value of unity are from studies in which the energy, crude protein and degradable protein contents and the digestibility values of the particular forages were known. The study was conducted in a dry lot so feeding could be controlled and appropriate measurements made.

Conversely, grazing cattle experience a new set of nutritional circumstances almost daily. In a plant multicultural situation such as native pastures and ranges, some plants are maturing, others are in dormancy while still others are in the growth stage. In some instances cattle may consume browse. Even in a monocultural situation, changes in plant nutrient content can be rapid. Further, some plants can contain substances that interfere with protein degradability such as tannin. Therefore, we are employing a higher value.

Protein From Forage

The degradability of plant protein can vary from about 40 to 50% in young growing plants to as high as 100% in very mature plants. It is impractical for the rancher to calculate degradable protein levels and reformulate his supplement each time he receives a laboratory report. Therefore, a value of 80% of the crude protein is used as an estimation of the degradable protein content of the plant. The opportunity for error with the 80% estimation is with the mature plant. In the case of the young plant, crude protein levels are sufficiently high so there is ample degradable protein.

Excessive Amounts

The amount of supplemental degradable protein is equal to 0.07 times forage fermentable energy (NE_m) consumed minus forage degradable protein consumed. Poor quality forage (low NE_m) requires only a small amount of degradable protein to be fully utilized. All the urea in the world is not going to improve the utilization of sawdust. The following table shows the relationship. The top row of values is the fermentable energy contained in the forage. They are part of your forage analyses reports. The middle row of values is an indication of feed consumption by a 1000 lb. cow, which you learned in the School to calculate from the NE_m content of the forage. Degradable protein requirement, shown in the bottom row, is the product of 0.07 times NE_m consumption.

Forage NE_m Content (Mcal/lb)					
0.30	0.35	0.40	0.45	0.50	0.55
NE_m Consumption (Mcal/day)					
4.5	6.9	9.6	12.5	15.5	18.7
Deg. Protein Required (lb/day)					
.31	.49	.67	.87	1.08	1.31

The next table indicates the degradable protein that the forage will provide. The left column is the percentage forage crude protein reported by the laboratory. All of the other values show the degradable portion of the crude protein that will be consumed based upon NE_m consumption in the previous table. Comparison of the values with the bottom row of the previous table indicates a shortage or surplus relative to requirement. The bolded values in this table indicate that degradable protein requirements will not be satisfied by forage protein. Supplementation is in order.

CP	Forage Deg. Pro. (lb/day)					
3	0.36	**0.48**	**0.58**	**0.66**	**0.74**	**0.82**
4	0.48	0.63	0.77	0.89	**0.99**	**1.09**
5	0.59	0.79	0.96	1.11	1.24	1.36
6	0.71	0.95	1.15	1.33	1.49	1.63
7	0.83	1.11	1.34	1.55	1.73	1.90
8	0.95	1.27	1.54	1.77	1.98	2.18

Urea Cycle

All animal tissues continually are being metabolized (built up and torn down). A by-product from this process is urea. When the ammonia concentration (from the degradable protein) in the rumen is less than that in the blood, the blood urea crosses the rumen wall. It is a major source of degradable protein for the rumen microorganisms. For example, when the dietary crude protein is 4%, the recycled urea-nitrogen can equal 86% of the dietary nitrogen.

Schools in '95

Boise, ID September 26 - 29

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Your questions and comments sincerely are appreciated. Please call or write:

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[a] Poppi, D. P. and S. R. McLennan. 1995. Protein and Energy Utilization by Ruminants at Pasture. J. Anim. Sci. 73:278.