SUPPLEMENTATION OF RATIONS FOR LACTATING DAIRY COWS WITH PROTECTED ISOLEUCINE

F.N. Owens[1], L.J. Bush[2], T. Nalsen[3] and G.D. Adams[4]

Story in Brief

A typical ration for lactating dairy cows was supplemented with 6g/day of protected isoleucine. Intake of dry matter by both supplemented and unsupplemented cows was relatively high, averaging 62.3 lb/day, and intake of total protein was 126% of NRC requirements. Neither milk yield nor its composition was affected by supplementation with protected isoleucine under the conditions of this experiment.

INTRODUCTION

Under some conditions, certain amino acids have been found to be limiting for high milk production by dairy cows. Lysine and methionine have been identified by some researchers as the amino acids most likely to be limiting for cows fed typical rations; however other amino acids have been suggested as limiting on the basis of infusion studies or other types of estimates of amino acid supply and need for milk synthesis. By calculation of the amount of different amino acids needed for high milk yield and those available at the site of absorption, it appears that isoleucine may limit milk yield under some conditions. The purpose of this trial was to determine whether supplementation of a typical ration with protected isoleucine would affect milk yield and composition by dairy cows.

MATERIALS AND METHODS

Twelve Holstein cows were started at 7 to 11 weeks after calving on an experiment in which treatments were alternated according to a switchback design with three periods of four weeks each. The treatments were 5 daily supplement of 6 grams of protected isoleucine[5] and a central (no supplementation). The protected isoleucine was premixed with a small amount of ground corn and added to the concentrate of the appropriate cows at one feeding each day. All cows were fed a ration consisting of 50% concentrates (Table 1), 35% sorghum silage, and 15% alfalfa hay on a dry basis. The concentrate mixture and silage were mixed together before feeding the allotted amount to each cow, whereas the hay was fed separately in individual stanchions. Samples of concentrate mixture, silage and hay were taken weekly for determination of dry matter and protein content. Weighbacks of refused feed were taken daily and during each of the last two weeks of each period a composite was made of the concentrate-silage weighback for each cow to determine dry matter and protein content.

Milk weights were recorded at each milking and samples were taken at four consecutive milkings each week for determination of fat and protein content. The cows were weighed on two consecutive days prior to starting the experiment and during the last week of each period.

---

[1]Professor [2]Professor Emeritus [3]Graduate Student [4]Instructor [5]Research product generously supplied by Degussa Corp., Teterboro, NJ 07608.

Results and Discussion

Intake of total dry matter was relatively high for both groups and not affected by supplementation with protected isoleucine (Table 2). Intake was greater than predicted on the basis of commonly accepted prediction equations. This, along with higher than expected protein

Table 1. Composition of concentrate mixture for cows.

Item	Amount
Ingredients (% as fed)	
Corn	50
Sorghum grain	10.5
Soybean meal, solv.	30
Molosses, liquid	5
Salt	.75
Sodium bicarbonate	1.25
Magnesuim oxide	.5
Calculated analysis (as fed basis)	
Net energy (NEl), Mcal/100 lb	74.1
Crude fiber, %	2.9
Crude protein, %	18.8
Rumen escape protein, %	8.0

Table 2. Responses of cows to experimental rations

	Treatment group	
Item	Control	Isoleucine
Dry matter intake, lb		
Concentrate mix	31.3	31.4
Silage	21.9	21.9
Hay	9.1	9.1
Total	62.3	62.4
Crude Protein intake		
Amount, lb	9.74	9.78
% of DM	15.6	15.6
% of NRC requirement	126	126
Milk yield		
Milk, lb/day	70.5	70.6
Fat, %	3.94	4.01
Protein, %	3.09	3.09
4% FCM	69.7	70.6
Weight change lb/4-week period	21.0	17.9

content of the alfalfa hay, i. e., 20.2% on a dry basis, resulted in total protein intake approximately 26% in excess of 1978 NRC requirements. Under these conditions, amino acids which might otherwise be limiting were likely supplied in ample quantity for milk synthesis.

Milk production of the cows was not affected by the addition of protected isoleucine to the ration. Likewise, the fat and protein content of the milk was similar for both groups and within acceptable limits for Holstein cows. It does not appear that isoleucine was a limiting factor for milk production under conditions where cows are fed a ration containing adequate or excess total protein, especially with the protein sources used in this experiment. With corn and sorghum grain as the principal energy sources in the concentrate mixture, the amount of protein estimated to escape ruminal degradation was 8.0% or 42.6% of dietary protein(Table 1). If other ingredients comprised the concentrate mixture, the percentage of ruminal escape protein could be considerably lower and if blood meal were used as a supplement, its notably low isoleucine content might be of concern.

The goal of most trials with amino acid supplementation or escape has been to increase rate of production; current diets are formulated to attain near maximum production. Though more difficult to study, efficiency and economics of production needs to be considered, not total production alone when evaluating new feedstuffs, byproducts and feed additives. Such a change will force researchers and producers to consider the many factors involved in production efficiency from the diverse diets fed in different areas and seasons of the year. This could have a bearing on availability of different amino acids at the site of absorption in the intestine and there by on the likelihood that a given amino acid will limit production.