What Do High Producing Herds Really Feed?

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Introduction

Milk production continues to increase due to advances in genetics, forage quality, herd management, cow comfort, increased nutrition knowledge and ration formulation approaches. The highest current record for a Holstein cow is 78,170 pounds of milk in 365-day lactation. This is an average of 214 pounds of milk per day. There are 186 Holstein herds with rolling herd averages of >30,000 pounds of milk per cow for herds that process records through the Raleigh dairy records processing center. These are herds in the East and Midwest regions of the U.S. There are 17 of these herds located in New York. Overall, these herds represent 2.5% of the Holstein herds processed through this center. High levels of peak milk production are needed to attain these high levels of milk production. Peak milk production of 104, 134 and 146 pounds per day for 1st, 2nd and 3rd+ lactation cows were reported for herds with a rolling herd average of 34,000 pounds of milk per cow.

There have been previous papers that have examined the rations or feeding practice used in high producing herds (Barmore, 2002; Boterman and Bucholtz, 2005; Endres and Espejo, 2010 and Shaver and Kaiser, 2004). A symposium paper outlined the strategies used to develop rations for high producing herds (Chase, 1993). This paper will use a similar approach with current rations used in high producing herds.

Approach

The rations evaluated in this summary are from several sources. Some are from field research projects that the Cornell group has conducted or herds we have interacted with. A request was also sent to feed companies and nutritional consultants for current rations of high producing herds. The goal was to use rations fed in the last 10 years. The response from our industry partners was very good. Key points on herd selection and data analysis are listed below.

1. Herd selection criteria:
    a. >95 lbs. milk/cow/day if feeding a 1-group TMR.
    b. >100 lbs./cow/day for the high group ration in herds with multiple feeding groups.
2. All rations were evaluated using the CNCPS 6.5.5 model. However, if an AMTS or NDS ration file was provided, the information from these programs was used.
3. Feed library forage analyses were modified based on forage analysis data provided from the farms.
4. CNCPS feed library values were used for non-forage feeds and modified only if analytical values were provided with the rations submitted.

5. Dry matter intake and body weights used were from the rations submitted. No modifications were made.
6. Milk production used in preparing the summary was the lowest of the ME or MP predicted milk from the CNCPS model. This was done since the input milk values provided with the rations were a mix of actual or targeted milk production. Using the lowest ME or MP milk provided a uniform approach for all herds and groups.
7. No adjustments were made to the amounts of each feed included in the rations.

Results

Table 1 provides descriptive information on the herds used. Feed efficiency (ECM/DMI) and daily pounds of milk components produced are high compared with lower producing herds. Methane emissions per pound of milk tend to be lower than herds producing less milk per day.

Table 1. Herd characteristics, milk components and methane emissions.

Item	High Herds Mean	High Herds Range	High Groups Mean	High Groups Range
Number	26		53	
Body Weight, lbs.	1530	1400 - 1650	1557	1400 – 150
Dry Matter Intake, lbs.	59.7	54.2 – 60.3	60.5	50 – 69.8
Milk, lbs./day	104	92 – 128	107	95 – 129
ECM, lbs./day	108.5	98.6 – 125	110.8	98 - 129
Milk fat, %	3.77	3.2 – 4.1	3.7	3.2 – 4.2
Milk fat, lbs./day	4.02	3.7 - 4.05	4.07	3.58 – 4.83
Milk True Protein, %	3.05	2.8 – 3.3	3.06	2.9 – 3.2.
Milk True Protein, lbs./day	3.26	2.87 - 4	3.35	3 – 3.84
Milk Components lbs./day	7.3	6.6 - 8.3	7.4	6.6 – 8.6
ECM/DMI	1.82	1.64 – 2	1.83	1.58 – 2.15
CH_4, grams/day	495	441 – 551	493	419 - 585
CH_4, g/lb. milk	4.56	4.2 – 4.93	4.45	3.7 – 5
CH_4, g/lb. DMI	8.29	7.54 - 9.15	8.15	7 – 9.54

Tables 2 and 3 contain information on the forage and energy sources used in these rations. Conventional corn silage was the primary forage fed in 34 of these herds and groups. BMR corn silage was the main forage fed in 14 herds and groups. Three herds from Israel used wheat hay or silage as the primary forage. A wide variety of energy sources were used (Table 3). There were 3 high herds and 2 high groups that fed no animal or bypass fats in the ration.

Table 2. Forages fed, number of herds.

Forage	High Herds (26 herds)	High Groups (53groups)
Corn silage	15	46
BMR corn silage	7	24
Legume silage	14	36
Legume hay	8	5
Grass silage	2	6
Grass hay	2	5
Mixed legume-grass silage	5	14
Mixed legume-grass hay	1	3
Straw	6	9
Small grain silage	4	1
Wheat silage or hay	3	1

Note: 12 of the high groups used a blend of conventional and BMR corn silage.

Table 3. Concentrate and fat sources fed, number of herds

Feed	High Herds (26 herds)	High Groups (53 groups)
Corn grain	23	48
Flaked corn grain	1	6
High moisture shelled corn	7	14
High moisture ear corn	2	5
Molasses	7	12
Soy hulls	8	18
Beet pulp	0	2
Citrus pulp	2	14
Whole cottonseed	14	19
Chocolate/Candy	0	7
Bakery byproduct	2	10
Whey (liquid)	6	15
Sugar (added)	1	11
Wheat midds	3	16
Animal fat	9	24
Bypass fat	20	47

Table 4 contains information on the protein and amino acid sources fed. A combination of soybean meal and expeller soybean meal was used in 9 of the high herds and 32 of the high group herds. Ten of the high herds used a mix of soybean and canola

meal. This combination of protein sources was used in 28 of the high groups. There were no added methionine products used in 9 of the high herds and 6 of the high group rations. There was limited use of supplemental lysine products in these herds.

Table 4. Protein and amino acid ources fed, number of herds

Feed	High Herds (26 herds)	High Groups (53 groups)
Soybean meal	15	38
Expeller soybean meal	17	42
Roasted soybeans	6	12
Canola meal	16	36
Distillers grain	13	19
Corn gluten meal	1	6
Corn gluten feed	7	8
Corn germ meal	0	6
Urea	11	29
Blood meal	10	24
Animal protein blend	3	21
Added Methionine product	16	43
Added lysine product	4	11
Herds not using a methionine product	10	10

Table 5 has information on the nutrient composition of the rations fed in these herds. The mean values for CP, NDF, sugar, starch and fat are like the rations in many dairy herds. However, the wide range of these values between herds is very interesting. Ration CP varies from 13.8 to 18.4% of ration dry matter. Ration NDF levels vary by 5 to 10 points between herds. Ration starch ranges from 20.6 to 33%. There are wide ranges for most of the other nutrients. The average lysine and methionine levels are slightly lower than current recommendations when expressed as a percent of the MP. However, there are large differences between herds in these values. Total ration unsaturated fatty acid intakes are high compared with other herds. The main reason for this is the higher dry matter intakes in these high herds and groups. The CNCPS predicted daily rumen degradability of selected feed fractions is in Table 6. The rumen is actively degrading large quantities of nutrients due mainly to the high levels of dry matter intake.

Summary

This dataset provides an insight into the rations used in high producing herds and groups. The quantity of forage fed ranged from 33 to 69% of the total ration dry matter. These herds are producing high levels of milk using a variety of forages and other ration ingredients. Many of the ration nutrient composition values are like the values from other dairy herds. These herds are producing high levels of milk by a combination of factors that allow the cows to attain higher levels of dry matter intake. This result has also been observed in other high herd evaluation studies.

Table 5. Ration nutrient composition.

Item	High Herds	High Groups
CP, % of DM	16.9 (15 – 18.4)[a]	16.7 (13.8 -18.3)
MP, g/day	3143 (2889 – 3604)	3191 (2889 - 3647)
Microbial Protein, % of MP	50.5 (44.4 – 59.4)	50 (44.9 – 56.8)
ME, Mcal	71.2 (65.5 - 83.1)	72.3 (60.5 - 82.8)
NDF, %	30.3(24.9 - 34.1)	30 (25.7 - 35.7)
Forage NDF, % of NDF	72.4 (54.3 - 86.9)	75.5 (51.4 - 87.1)
Forage NDF, % of BW	0.84 (0.65 - 1.05)	0.88 (0.59 - 1.14)
Fermentable Fiber, % of DM	22.2 (18 - 30.1)	22.2 (17.7- 28.4)
Sugar, % of DM	4.55 (2.9 – 8)	4.4 (2.2 – 7.6)
Starch % of DM	26 (21.1 - 29.7)	27 (20.6 - 33)
Fermentable Starch % of DM	19.75 (16 - 23.9)	20.4 (16.5 - 24.8)
Soluble Fiber, % of DM	6.24 (1.1 – 9.6)	5.0 (2 – 8.9)
NFC, % of DM	40.4 (36.4 - 45.7)	40.6(34.8 - 45.3)
Fat, % of DM	5.2 (3.3 - 6.4)	5.1 (3.7 – 6.9)
LCFA, % of DM	4.1 (2.4 - 5.6)	4.2 (2.9 - 6)
Lysine, % of MP	6.55 (5.83 - 7.02)	6.65 (6.2 - 7.1)
Lysine, g/Mcal ME	2.9 (2.57 - 3.26)	2.93 (2.68 - 3.62)
Methionine % of MP	2.3 (1.92 - 2.72)	2.4 (2.09 - 2.76)
Methionine, g/Mcal of MP	1.02 (0.87 - 1.2)	1.08 (0.9 - 1.29)
C 16:0 fatty acid intake, g	271 (100 - 454)	307 (136 – 527)
C 18:2 fatty acid intake, g	425 (279 - 574)	394 (266 - 682)
Total unsaturated fatty acid intake, g	739 (492 – 996)	688 (486 - 975)

[a] Values in parenthesis represent the range for each nutrient.

Table 6. Rumen Degraded Starch, Fiber and Protein, grams/day

Item	High Herds	High Groups
Starch	5319 (4708 - 6318)	5621 (4320 - 6707)
Fiber	3998 (2372 – 5927)	4153 (3289 - 5947
Total carbohydrates	11910 (10756 - 13533)	12068 (10450 -13868)
Protein	2673 (2318 - 3075)	2641 (1992 - 3276)

References

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