Feeding and Managing a Herd for 100 Pounds of Milk/Day - Thinking Outside the Normal Paradigm

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If you want your dairy herd to produce 100 pounds of milk per day, then you must consider the following principles.

1. Each additional pound of peak milk will yield 239 pounds of milk over a 305-day lactation.
2. First-lactation animals need to produce 75% of the expected mature cow production.
3. Second lactation animals need to produce 90% of the expected mature cow production.
4. First-lactation animals should make up only 35% of the milking herd.
5. Third and greater lactation cows need to average 115 pounds of milk.
6. Second lactation cows need to average 103 pounds of milk.
7. First lactation cows need to average 80 pounds of milk.
8. Dry matter (DM) intake of the close- up will impact DM intake after calving. Maximize intake prior to calving, so that DM intake is maximized in the first 28 days in milk.

The goals that are set for your herd will depend on the demographics of the herd. What percentage of the herd are mature cows is an important factor. The mature cows are the engine of the herd, pulling the rest of the herd with them. The mature cows are able to produce more than 100 pounds per day and they will make up for the lower production of the first lactation animals. Consider the following group of cows. To make the math easy to follow assume that we have 100 milking cows and 35% of them are 1st lactation cows. Mature cows make up 40% of the group. Second lactation cows make up 25% of the group. Given these demographics, you can calculate production goals to reach 100 pounds of milk. Milk production of the mature cows needs to be 115 pounds of milk. Their contribution to the daily milk production is (115 x 0.40) = 46 pounds or percent. Milk production of the second lactation cows needs to be 103 pounds. Their contribution to daily milk production would be (103 x 0.25) = 26 pounds or percent. The first lactation cows need to contribute 28 pounds or 28% to daily milk production. Since first lactation cows make up 35% of the group, they need to produce (28/0.35) = 80 pounds of milk. If you add 46 + 26 + 28 = 100 pounds of milk. The objective of this exercise was to illustrate that each herd has their own unique demographics. If your herd contains 40% first-lactation cows, then the older cows in the herd are going to have to give more milk then in our example, if you want to reach 100 pounds.

To set production goals for your herd you need to repeat this exercise. You should start with a realistic projection of first-lactation cow milk production. Since you already know what percentage of your herd is first-lactation cows, you can estimate their contribution to daily milk production. When you know the contribution of the first lactation animals, then you can set goals for the second-lactation and older cows. Since first-lactation cows will be allocating approximately 20% of their nutrient intake toward growth, they will only produce about 75% of mature cow milk production. If you want to average 100 pounds of milk per cow, you need to focus on getting high milk production from your older cows. To optimize milk production of the older cows, you need to start with their dry cow program. Getting mature cows to consume more than 30 pounds of dry matter during the close-up period will help them eat more after calving. This will reduce body condition loss during the first 30 days of lactation. Excessive loss of body condition during the first two weeks of lactation can lead to fat accumulation in the liver. This accumulation of fat in the liver will reduce glucose production by the liver. What is observed is sluggish appetite and poor start-up milk in these cows. If a herd is to maintain milk production of 100 pounds per day, you cannot have poor start-up milk and sluggish appetite in fresh cows.

Optimizing Dry Matter Intake of Transition Cows

Field trials on commercial dairies has shown that feeding a low starch, high sugar and soluble fiber diet

to close-up cows has increased dry matter intake. In a mixed pen of first-lactation and mature cows, dry matter intake was increased 1.7 pounds per day when cows received a low starch, high sugar and soluble fiber pre-fresh diet (Dort College Trial). After calving, cows were split by parity into two groups, first-lactation cows and mature cows. Both groups received a high sugar and soluble fiber diet through 30 DIM. Dry matter intake during the first 30 days in milk was increased 2.6 pounds in the mature cows and 4.5 pounds in the first-lactation cows compared to the pre-treatment period. Paramount dairy in Michigan was already getting good dry matter intake in their pre-fresh cows. During the pre-treatment period, pre-fresh cows consumed 32 pounds of dry matter. The pre-fresh diet during this period contained 9 pounds of chopped wheat straw. When pre-fresh cows were put on a low starch, high sugar and soluble fiber diet during the treatment period, dry matter intake was increased to 35 pounds with 11 pounds of chopped straw in the diet. These two fields trials demonstrate that feeding QLF liquid supplement during the close-up period at four to five pounds as fed (2.5 – 3.0 lbs. DM) stimulates dry matter intake in close-up cows. These trials did not have a control group but there was a control group in the trial at Swisslane dairy. At Swisslane dairy, after calving there were three treatments, control (no liquid supplement), high sugar and soluble fiber (QLF) and high sugar and soluble fiber plus NutriTek (QLFNT). Both QLF molasses-based liquid supplements and Diamond V yeast-based product NutriTek have been shown to boost dry matter intake and milk yield in transition cows. In addition, NutriTek contains bioactive fermentation compounds, including antioxidants and polyphenols, which may enhance the immunity of transition cows and help them better cope with metabolic stress and inflammation. Anytime stress can be reduced on cows in the transition period, it is a good thing.

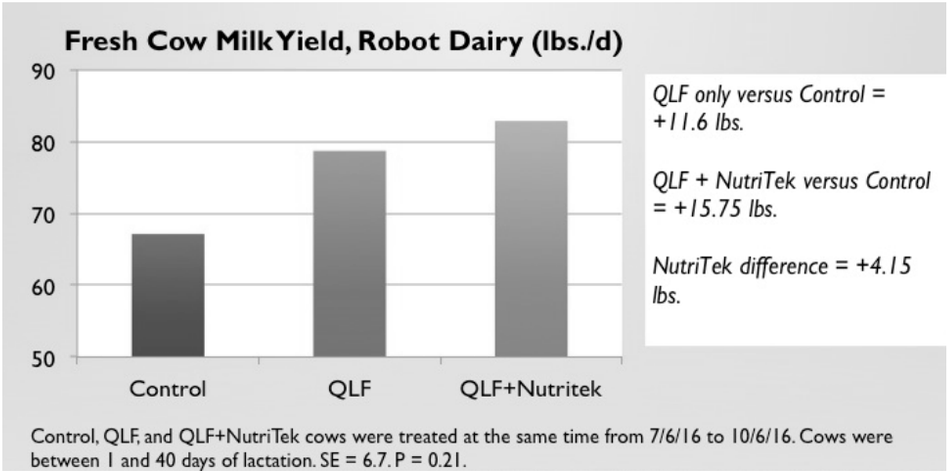
Experimental Protocols at Swisslane Dairy:
Swisslane Dairy located at Alto, MI with a herd size of 2450 cows, has both conventional and robot operations. The robot operation milks 480 cows with eight Lely robot stations. The trial was conducted from July 6, 2016 through Jan. 31, 2017. A QLF liquid supplement was formulated to supply 19 g of Diamond V NutriTek when fed at 4 pounds as fed. This liquid supplement contained 6% crude protein and 27% total sugar on an as-fed basis. All close- up mature cows received on a dry matter basis, a low starch (16%), high sugar (8.6%) and high soluble fiber (6.5%) diet. This diet was fed for 21 days pre-calving. After calving, early lactation mature cows in the robot herd were randomly assigned to either the control, QLF or QLFNT treatments. The treatments were delivered into the feeding station on the Lely robotic milking pod. Treatments, 4 pounds of liquid supplement as fed were dropped on top of the pellets being fed to the cows. Individual cows were milked by robots about 3 times per day, so QLF and QLF with NutriTek was targeted to be delivered by the pumps to feeding pans at 1.33 lbs. as-fed per milking visit (see images below). Treatments were fed through 100 DIM.



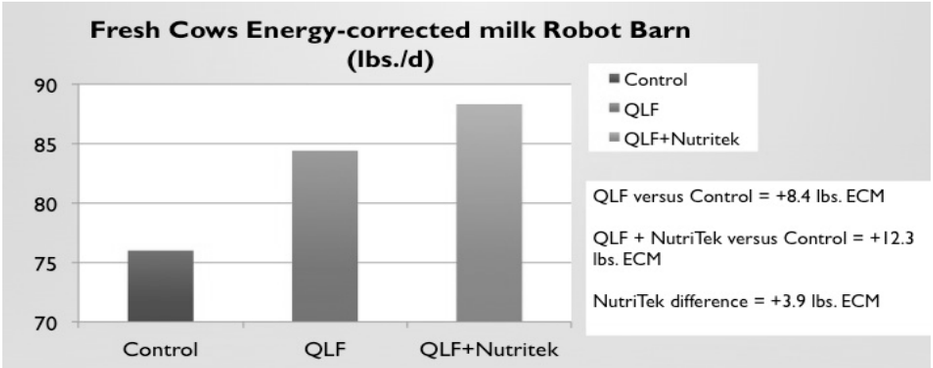
Results: Swisslane Dairy Robot Herd:
Compared with Control, feeding QLF during early lactation increased milk yield by 11.6 lbs., and QLF+NutriTek increased milk yield by 15.75 lbs. Energy-corrected milk was increased by 8.4 lbs. with QLF, and 12.3 lbs. by QLF+Nutritek. Rumination time, an indicator of rumen and cow health, increased 25 min per day with QLF and 33 min per day with QLF+NutriTek. What may have contributed to the increase in milk was the increase in dry matter in the close-up cows. When close-up cows received a low starch, low sugar diet, they consumed 29 pounds of dry matter intake. When close-up cows received a low starch, high sugar, high soluble fiber diet, the cows consumed 35.9 pounds of dry matter. Total cases of fresh cow diseases were similar among the 3 treatments.

Economic Analysis:
Does it pay to feed QLF or QLF+NutriTek during the transition period? Using the observed milk response from the well-controlled study at Swisslane Dairy Robot Herd, feeding QLF+NutriTek generated a net return of $0.88 cow/day at $16 hundredweight milk price. In the Dordt College field trial, the net return even after accounting for the additional dry matter

intake pre-fresh and post-fresh was $1.27 per cow/day at $16 hundredweight milk price. From the perspective of improved fresh cow health, data from Paramount Dairy showed that QLF + NutriTek generated a 3.85 return on investment, which was a saving of $25,978 for every 1000 cows. Feeding a low starch, high sugar and soluble fiber diet pre-fresh, which was followed by a moderate starch (24 – 26%, high sugar (7 – 8%), high soluble fiber (6 -8%) using QLF and QLF +NutriTek generated highly positive return on investment for the dairy producers. More importantly, these positive impacts on start-up lactation should continue to carry over throughout the entire lactation and provide long-term positive returns.



Control, QLF, and QLF+NutriTek cows were treated at the same time from 7/6/16 to 10/6/16. Cows were between 1 and 40 days of lactation. SE = 6.7. P = 0.21.



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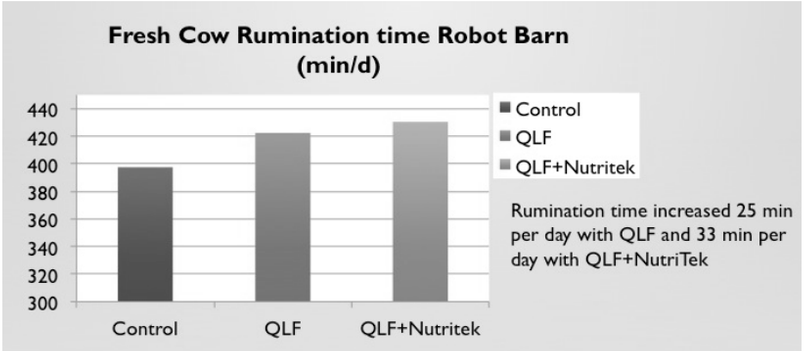
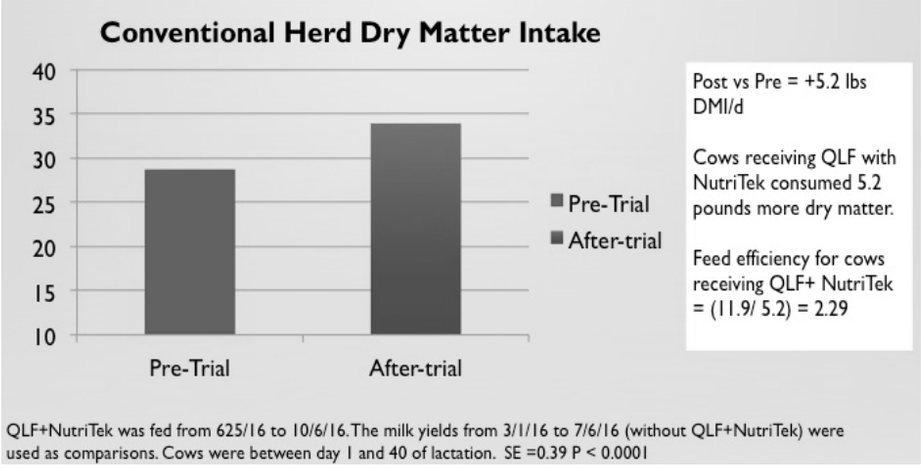


At Swisslane Dairy Robot Herd, Control, QLF, and QLF+NutriTek were treated at the same time from 7/6/16 to 10/6/16. Cows were between day 1 and 40 of lactation. SE = 17. P = 0.41.



Does it pay to feed QLF + NutriTek during the Transition Period Based on Reduction in Death Loss, Metritis and DA?
Close- up period = 21 days, Post- fresh period = 30 days
Cost of NutriTek = $0.15/cow/day

	No QLF+ NutriTek	QLF+ NutriTek	Cost/Cow, $
Pre-Fresh Diet, $/Day	4.04	4.26	(0.22 X 21) = $4.62
Lactating Cow Diet, $/Day	6.69	6.84	(0.15 X 30/) = $4.50
Total Cost, $/Cow			$9.12
Cost to Feed 1,000 Transition Cows, $			$9,120
Reduction in Metritis per 1,000 Cows		74 less	(74X$304) = $22,498
Reduction in DA per 1,000 Cows		15 less	(15X$340) = $5,100
Reduction in Death Loss /1,000 Cows		3 less	(3X$2500) = $7,500
Return on Investment			($35,098/$9120) = 3.85:1

Conclusions

If you want to attain 100 pounds per day in your dairy herd, it is all about maximizing dry matter intake beginning with the pre-fresh period through the fresh cow period and continuing through 150 DIM. The feeding strategy presented in this paper increased dry matter intake in pre-fresh cows and early lactation cows. This was responsible for these cows reaching higher peak milk, having fewer fresh cow issues and having stronger start-up milk. What makes this strategy work is feeding less starch and more sugar and soluble fiber. This creates a healthy environment in the rumen to enhance fiber digestion. By enhancing fiber digestion, rumen-fill is reduced and cows are able to consume more dry matter intake. This program begins with high quality forage and the dairy should use technology that improves the quality and fermentation of silage and use technology that increases dry matter intake and glucose supply in high producing cows. It is also necessary to address ration sorting on the farm. By eliminating ration sorting by using a molasses-based liquid supplement, the cow will consume more rumen effective fiber. This will result in a healthier rumen environment with less risk of SARA and better digestion of fiber. The impact of better fiber digestion will be higher milk components. The goal is to ship a minimum of 6.5 pounds of components. This will require a 3.6% fat and a 3.0% protein at 100 pounds of milk. To achieve this goal requires removing the bottlenecks on the dairy to high dry matter intake and putting up high quality digestible forages.

Feeding and Managing for 35,000 Pounds of Production: Diet Sorting, Dry Cow Strategies and Fiber Digestion

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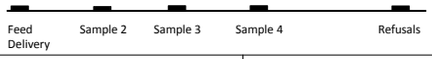
Sorting Behavior of Dairy Cows: Commercial TMR Survey

- 50 Freestall Dairies - Minnesota
- Univ. of MN Study
- Sorting Measured in High Production Group (117 ± 51 cows) TMR Sampled 5 times during feeding period



# Cows	>150
Feeding Frequency	70% feed 1x/ daily
Frequency of Feed Pushup	3 – 12 x daily
Linear Feed bunk space/ cow	18"
Daily Milk Yield/ cow	88 lbs.

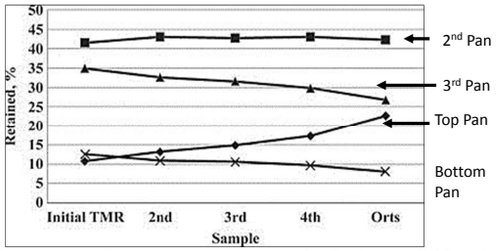
JDS 93:822-829

Goals for Getting to 100 Pounds of Milk

35% First lactation animals in herd
65% pregnant by 120 days in milk
Average 150 – 155 DIM
Peak Milk Mature Cows = 130 pounds
Peak Milk 2nd Lactation Cows = 117 pounds
Peak Milk 1st Lactation Cows = 98 pounds

32 -35 pounds DMI in pre-fresh cows
Eliminate sorting of the pre-fresh and lactating cow diets
Feed a low starch (12 – 14%), high sugar (7.5 – 8.5%), high soluble fiber (7 – 9%) pre-fresh diet.
Use technology that reduces fresh cow diseases.
Use technology that improves forage quality and increases feed intake.

Particle Distribution Change Over Time



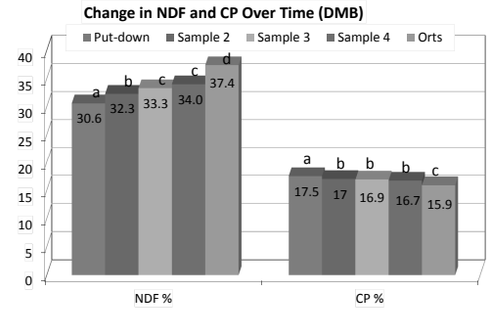
Average percentage of material retained on each sieve of the Penn State Forage and TMR Particle Size Separator over time [top (♦;>19mm), second (■;>8mm), third (>1.18mm), and bottom (×;<1.18mm pans] for 50 freestall herds in Minnesota. Samples represent the initial TMR collected at feed deliver the second, third, and fourth samples collected every 2 to 3h after feed delivery; and the orts.

JDS 93:822-829

A straight line indicates that cows did not sort. A line curving up indicates that cows sorted against those particles. Cows sorted the TMR and left the long particles (>19mm) and consumed more of the short and fine particles (3rd pan and bottom pan).

Our Goal is to Ship 6.5 Pounds of Components per cow/day

- Example: 100 pounds of milk with a 3.6% fat test and a 3.0% protein test = 6.6 pounds of components per day/cow.
- Must drive dry matter intake in transition cows and high cows without depressing fiber digestibility.
- Think outside the normal paradigm.
- Traditional paradigm: Need to feed high starch diets to make milk and can't make milk on high forage diets.
- New paradigm: Feed a low to moderate starch diet with high sugar (7 – 8%) and high soluble fiber (6 -9%) and feed a minimum of 50% forage.
- This works because sucrose and glucose sugars increase fiber digestion compared to starch.



JDS 93:822-829

NDF content of the TMR increased by 22% and CP decreased by 9% due to sorting.

It is ration sorting that is causing lower than desired milk fat and milk protein.

Must Eliminate Sorting of the TMR

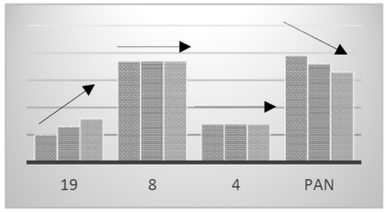
- All Cows Sort Their Ration

  - Cows sort against long particles in the diet (>19 mm).
  - Cows dig holes in the TMR to reach the short and fine particles.
  - A short or fine particle is anything smaller than 8 mm.
  - First Lactation Cows Sort More than Mature Cows.
  - Jersey cows are more effective sorters of the TMR than Holstein Cows.
  - Excessive sorting of the ration can increase the risk of SARA.
  - Sorting of the TMR reduces the intake of forage NDF.

Pattern 1 **Eat the goodies, leave the hay**

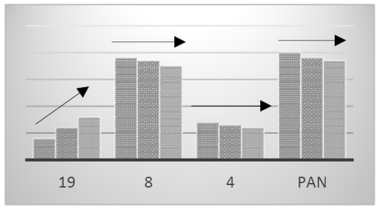
Description This is the classical view of sorting. Cows are sorting against the long particles and sorting for the short particles.

To Watch Particle length of top screen, Molasses liquid product like QLF, TMR DM%



Leads to SARA and lower milk component yields

Pattern 2	**Leave the hay, can't find the goodies**
Description	In this scenario the cows are sorting against the top screen but cannot sort for the pan. The bottom three layers disappear equally.
To Watch	Particle length of top screen

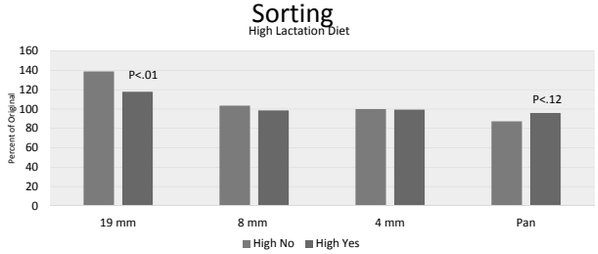


Leads to reduced milk fat and milk protein yields

Pre-fresh diet for swisslane dairy

Ingredient	DM, lbs.	As fed, lbs.	Nutrients	
Grass Hay	6.0	6.75	Crude Protein, %	13.0
Wheat Straw	2.2	2.70	Metabolizable Protein, grams	**1300**
Corn Silage	9.0	28.0	Starch, %	**16.1**
Wet Beet Pulp	5.0	19.2	Sugar, %	**8.65**
Pre-fresh grain	2.7	3.0	Soluble Fiber, %	**6.5**
Ground corn	1.1	1.3	Potassium, %	1.38
Wheat midds.	2.0	2.3	Sodium, %	0.14
Soybean meal	2.5	2.8	Chloride, %	1.33
QLF dairy transition 6	**2.4**	**4.0**	Sulfur, %	0.54
Total	32.9		NEL, mcal/lb.	0.66

Liquid Inclusion in the Diet: Effect on Sorting

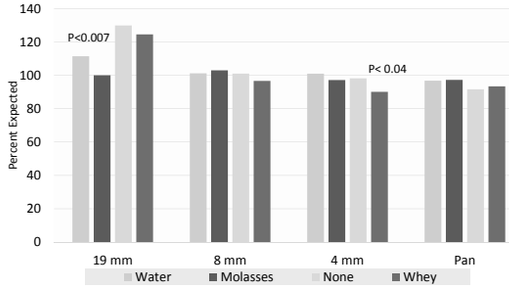


Value = 100 indicates no sorting. Values > 100 indicate sorting against those particles in the TMR. Inclusion of liquid in the TMR reduces the sorting of the top screen and cows consume more long particles. Adding liquid prevented sorting for fine particles.

High cow diet SwissLane dairy Robot Barn, No QLF Supplement.

Ingredient	DM, lbs.	As fed, lbs.	Nutrient	
Corn Silage	18.0	56.3	Crude Protein, %	16.30
Alfalfa silage	12.0	23.0	Starch + Sugar + Sol. Fiber, %	41.6
Dairy Hay	1.25	1.4	Starch, %	**27.84**
Whey Permeate	1.0	5.5	Soluble Fiber, %	**8.15**
Wet Beet Pulp	2.0	7.7	Sugar, %	**5.6**
Propel CHO	4.5	5.0	ME Milk, Pounds	109.0
Robot Pellet	12.6	14.5	Forage, %	46.9
Soy hulls/ Wheat Midds.	4.4	5.25	peNDF, %	16.75
Soybean meal	1.0	1.11	peNDF, lbs.	11.2
RUP Protein + Mineral	5.8	6.2	Methionine, grams	70
Bergafat T 300	0.32	0.33	Lysine, grams	226
Total	66.6		Fat, %	3.84

Effect of Type of Liquid on Sorting: Not All Liquids Eliminate Sorting of the TMR



Whey did not prevent the sorting of the long particles in the TMR. Whey encouraged the consumption of short particles at the expense of the long particles. Adding water was not as effective as adding molasses to reduce sorting

HIGH COW DIET SWISSLANE DAIRY ROBOT BARN, WITH QLF SUPPLEMENT

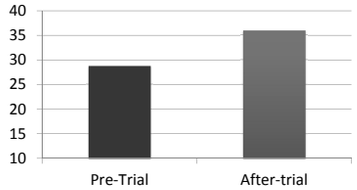
	DM, lbs.	As fed, lbs.	Nutrient	
Corn Silage	18.0	56.3	Crude Protein, %	16.27
Alfalfa silage	12.0	23.0	Starch + Sugar + Soluble Fiber, %	42.4
Dairy Hay	1.25	1.4	Starch, %	**26.0**
Whey Permeate	1.0	5.5	Soluble Fiber, %	**8.77**
Wet Beet Pulp	2.0	7.7	Sugar, %	**7.65**
Propel CHO	4.5	5.0	ME Milk, Pounds	109.0
Robot Pellet	12.0	13.8	Forage, %	46.1
Soy hulls/ Wheat Midds.	4.75	5.25	peNDF, %	16.7
Soybean meal	1.0	1.11	peNDF, lbs.	11.1
RUP Protein + Mineral	5.75	6.1	Methionine, grams	70
QLF dairy transition 6	**2.4**	**4.0**	Lysine, grams	226
Total	64.5		Fat, %	3.24

Optimizing Dry Matter Intake of Transition Cows: Feeding to Enhance Fiber Digestion and Reduce Diet Sorting

- Case Studies:

  1. Swisslane Dairy
  2. Dort College Trial
  3. Paramount Dairy

Pre-fresh mature cow dry matter intake (lb./d)



Pre-Trial DMI = 28.7 lbs.
Post-Trial DMI = 35.9 lbs.
Post vs Pre = +7.2 lbs.

QLF+NutriTek was fed from 7/6/16 to 1/31/17. The dry matter intake from 3/1/16 to 7/6/16 (without QLF+NutriTek) was used as comparison. SE = 5.2. ***P < 0.001.***

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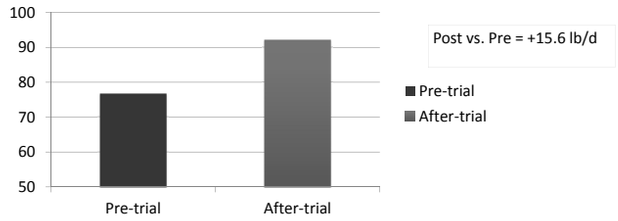
Conventional barn fresh cow milk yield (lb/d)



QLF+NutriTek was fed from 7/6/16 to 1/31/17. The milk yields from 3/1/16 to 7/6/16 (without QLF+NutriTek) were used as comparisons. Cows were between day 1 and 200 of lactation. SE = 8.0. ***P < 0.001.***

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Introduction

- Farm: Commercial Dairy, 400 cow Holstein Herd
- Issues dairy producer wanted to have fixed.
  1. Sorting of pre-fresh and post-fresh diet.
  2. Low Milk Fat Test in early lactation.
  3. Desire higher peak milk.
- QLF Dairy Transition 6 was fed at 4 pounds/cow pre-fresh and post-fresh (first 30 DIM).
- NutriTek from Diamond V was in the dry mineral.
- Diet adjusted to be iso-caloric and iso-nitrogenous to diet prior to QLF addition
- QLF liquid supplement replaced some corn and fat in the diet.

Average production data for all lactations based on entire RAW DATA (DIM 1 – 200) from Robot Barn

	Control	QLF	Difference
Milk yield, lbs./d	90.3	98.6	+8.3 lbs.
Milk Fat, %	3.57	3.64	
Milk Protein, %	3.13	3.12	
Milk Fat Yield, lbs./d	3.22	3.59	**+0.37**
Milk Protein Yield, lbs./d	2.83	3.08	**+0.25**
Energy-corrected milk, lbs./d	90.7	99.8	+9.1

Pounds of components shipped per cow = (3.59 + 3.08) = 6.67 when QLF supplement was fed. Pounds of components shipped for control cows = (3.22 + 2.83) = 6.05

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Dry Matter Intake, (lbs./day) Pre-QLF and during the QLF feeding period

	Pre-QLF Feeding	QLF Feeding Period	Difference
Pre-Fresh Mature Cows and 1st Lactation Cows	24.88	26.56	+ 1.7 lbs.
Fresh 1st Lactation Cows, DIM 1-30	34.06	38.58	+ 4.5 lbs.
Fresh Mature Cows, DIM 1-30	43.43	46.01	+ 2.6 lbs.

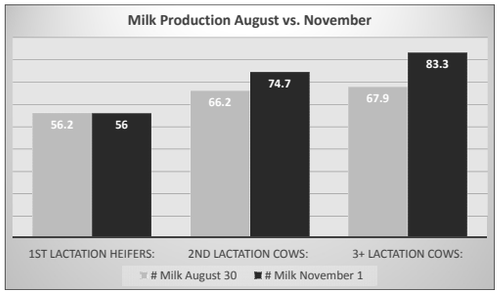
Pre-QLF period from Jan 1, 2016 through Sept. 15, 2016.
QLF feeding period from Sept. 16, 2016 through Nov. 18, 2016, 62 days.

Does it pay to feed QLF during the Transition Period and Lactation?

Close- up period = 21 days, Lactation Period: 1 - 200 DIM

	No QLF	QLF Dairy Transition 6	Difference, Cost/Cow, $
Pre-Fresh Diet, $/Pound of DM.	0.139	0.147	0.008
Pre-fresh DMI, Lb./d	29	35.0	($0.88 X 21) = $18.48
Lactating Diet, $/Day per lb. DM	0.1186	0.12	
Estimated DMI/d.	56.4	59.8	
Cost/Cow/day, $	6.69	7.18	(0.49 X 200 DIM) = $98
Breakeven Milk Response @ $16/cwt.			3.6 lb./day
Observed Milk Response All Lactations, 1- 200 DIM			+ 9.1 lbs. ECM milk/day
Net Return, (9.1 – 3.6) = (5.5 X 0.16)			**+ $0.88 per cow/day**

Results: Milk Production, lbs./cow



2nd lactation cows, + 8.5 pounds of milk.

3+ lactation cows, + 15.4 pounds of milk

Conventional Dairy Herd Trial Conducted by Students at Dordt College in Iowa.

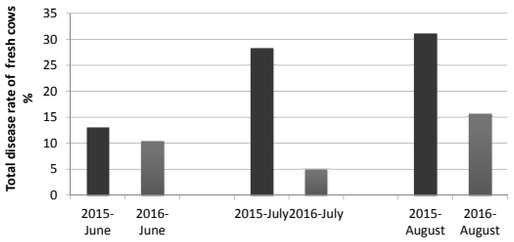
Nicholas Leyendekker, Imanuel Feodor, Ross Schreur
Senior Students, Dordt College

Economic Analysis of Dordt College Trial Accounting for Increased DMI when QLF and NutriTek were Fed

	Pre-QLF	QLF Feeding Period	Diff.
Pre-Fresh Diet, $/cow/day	3.00	3.45	
Cost for 21 days Pre-Fresh, $	63.00	72.45	+9.45
Fresh Cow Diet, $/cow/day	5.21	5.69	
Cost for 60 days of lactation, $	312.60	341.40	+28.80
Difference in cost for 81 days, $/cow			+38.25
Breakeven milk needed at $16/CWT			4.0
Actual Milk response, lbs.		(8.5 + 15.4)/2	11.95 lbs.
ROI at $18/CWT Milk Price		(11.95 – 4.0) X 0.16	$1.27/cow/d

PARAMOUNT DAIRY, CARO, MI

Total rates of Paramount Dairy fresh cow diseases



Average fresh cow disease rate for summer 2016 was 10.3%

Average fresh cow disease rate for summer 2015 was 24.1%

QLF+NutriTek was fed during June to August 2016. The disease rates in June to August 2015 (without QLF+NutriTek) were used as comparisons. Overall, QLF+NutriTek decreased total disease rates. DIM were between 1 and 30.

Ration

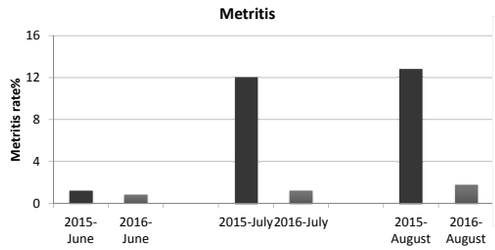
Dry and Pre-fresh cows	
Ingredient	**DM (lb./d)**
Dry cow mix	5.26
QLF-Nutritek	**3.02 (5 lbs. as fed)**
Straw	11.08
Canola	4.13
Corn Silage	9.52
Total	33.01

Started on May-5-2016

Fresh cows	
Ingredient	**DM (lb./d)**
Fresh cow mix	17.5
QLF-Nutritek	**3.02 (5 lbs. as fed)**
Straw	1.8
Haylage	8.0
Corn Silage	18
Total	48.32

Started on May-25-2016

Metritis rates of Paramount Dairy fresh cows



Metritis rates in summer pre-QLF + NutriTek were 8.7%

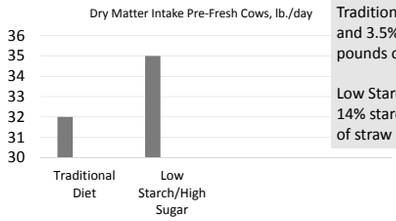
Metritis rates in summer with QLF + NutriTek were 1.3%

A reduction in Metritis rate of 85% (8.7-1.3/8.7)

Per 1000 cows that is 74 less cows with metritis. (87 – 13)

QLF+NutriTek was fed during June to August 2016. The disease rates in June to August 2015 (without QLF+NutriTek) were used as comparisons. DIM were between 1 and 30 of lactation.

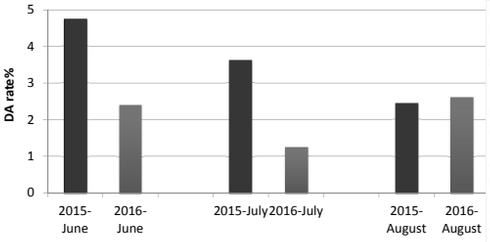
Impact of low starch, high sugar and soluble fiber diets on feed intake in close-up cows.



Traditional diet contained 16% starch and 3.5% sugar and contained 9 pounds of chopped straw.

Low Starch/High sugar diet contained 14% starch, 7.5% sugar and 11 pounds of straw

DA rates of Paramount Dairy fresh cows



DA rates in summer pre-QLF + NutriTek were 3.6%

DA rates in summer with QLF + NutriTek were 2.1%

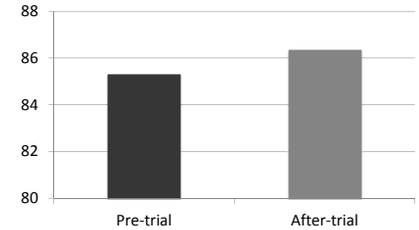
Per 1000 cows that is 15 fewer DA'S

A reduction in DA rate of 42% (3.6 – 2.1/3.6)

15 fewer DA's is a saving of $5,100

QLF+NutriTek was fed during June to August 2016. The disease rates in June to August 2015 (without QLF+NutriTek) were used as comparisons. DIM were between 1 and 30 of lactation.

Paramount Dairy Milk yield (lb./d)

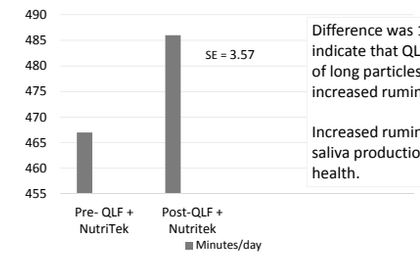


Heat Stress present in July and August 2016.

Milk increase was 1 pound but milk yield should have been lower due to heat stress.

QLF+NutriTek was fed from 5/25/16 to 8/31/16. The milk yields from 3/1/16 to 5/24/16 (without QLF+NutriTek) were used as comparisons. Cows were between day 1 and 40 of lactation. SE = 0.73. P = 0.28.

Rumination of Cows Pre- and Post QLF + Nutritek, Minutes/day

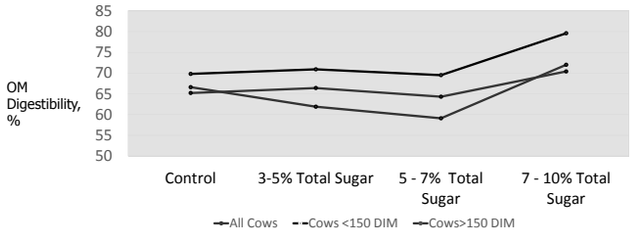


Difference was 19 minutes per day. This may indicate that QLF+NutriTek stimulated the intake of long particles in the diet, which require increased rumination.

Increased rumination is associated with increased saliva production, which may lead to better rumen health.

FIBER Digestibility and Sugar Feeding

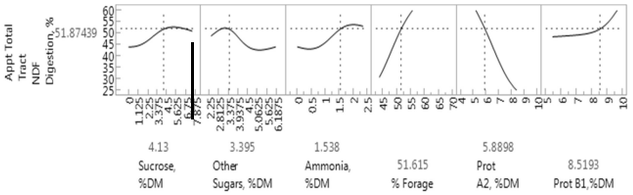
Impact of Sugar on Organic Matter Digestibility
n= 47



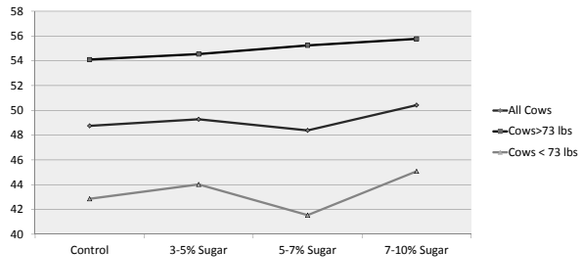
OM Digestibility increased 5 – 10 units when diet contained greater than 7% total sugar. Increased OMD leads to greater feed intake.

Impact of Sugars on the Digestibility of Fiber (NDF) in Lactating Dairy Cows

Key Points:
Fiber digestion optimized when the total sugar in the diet was between 7.0 – 7.5% (4.13 + 3.39)
Need at least 4.13% sucrose in the diet to optimize fiber digestion.
Optimum forage % = 51 – 57%



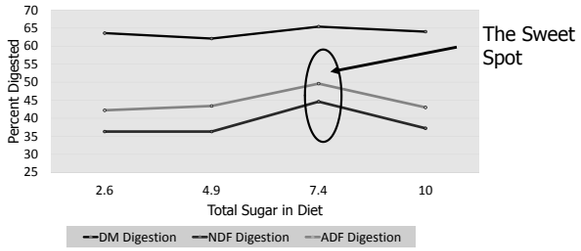
Net Result of Increased NDF and OM Digestibility is an Increase in Dry Matter Intake: Effect of Added Sugar on Dry Matter Intake, lbs./day.
Source: meta-analysis of 97 diet comparisons from 25 published trials



Overall Response to Added Sugar, was 1.7 to 2.1 pounds of DM Intake

Impact of Sugar on Diet Digestibility

Broderick and Radloff, J. Dairy Sci. (2004) 87:2997
60% Forage, Liquid Molasses Replaced High Moisture Corn



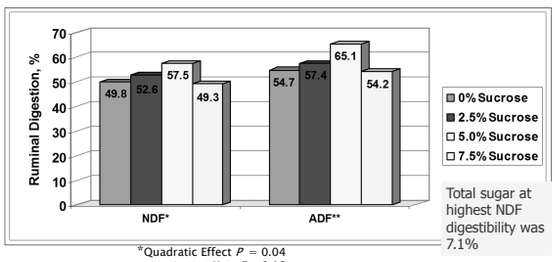
The Sweet Spot

Supplemental Sugar Recommendations to Optimize Dry Matter intake in Dairy Cows

- Supplement Enough! Aim for 7%- 7.5% Total Diet Sugar in lactating cow diets.
- Aim for 7.5 – 8.5% total sugar in dry cow diets
- Focus on Higher Producing Cows
- Provide Enough Rumen Degradable Protein (10-11%)
- Provide Adequate Rumen Effective Fiber, minimum 20% peNDF
- Monitor Cow Response
  - Measure DM Intake – DM intake should increase in dry cows and fresh cows.
  - Watch MUN's – MUN's should decrease
  - Watch Manure – should see less undigested fiber in manure
  - Watch TMR-Sorting – TMR sorting should decrease within 7 days.

Impact of Sucrose on Fiber Digestion

60% Forage Diet- Sugar Source Sucrose peNDF > 21%



Total sugar at highest NDF digestibility was 7.1%

*Quadratic Effect $P = 0.04$
**Quadratic Effect $P = 0.13$

Source: Broderick & et al. 2008. JDS:91:4801.