Management Techniques To Improve Silage Quality

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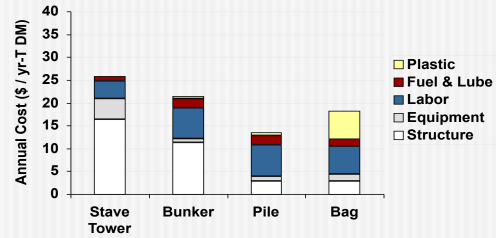
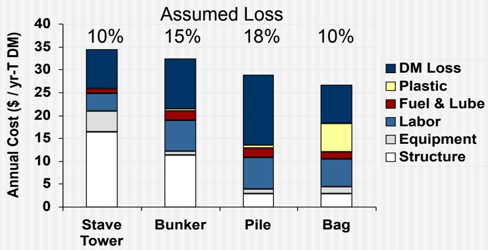
Annual Costs
3100 T DM Stored



Holmes, 1998

Annual Costs Considering Loss
3072 T DM Stored - Good Management



Holmes, 1998

DM Losses From Ensiling:

- Are all digestible
- Reduce the digestibility of the remaining silage

So How Do We Improve Silage Quality?

- Reduce dry matter losses
  - In other words, keep oxygen out!
- Goal-oriented use of silage additives

Scope of Talk

- Packing
- Sealing
- Feed Out
- Additives

PACKING FOR LOW POROSITY

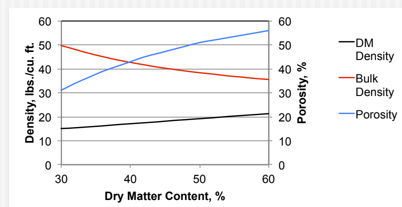
Porosity

- Gas volume surrounding the silage particles
- Oxygen movement into silage proportional to porosity
- So higher the porosity, the faster the rate of spoilage

Factors Related to Density in Bunker or Pile Silos

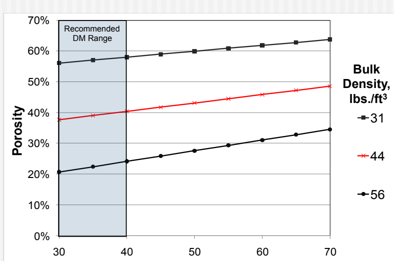
- **Tractor weight**
- **Packing time/ton**
- Layer thickness
- Silage height
- Particle size
- DM content

How Density Changes With DM Content For Identical Packing



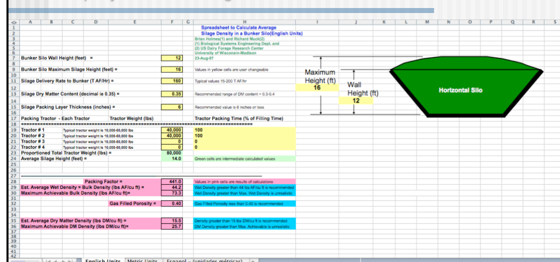
Bottom line: 1) The drier the crop, the more you have to pack to keep porosity low. 2) Bulk density a better target.

Porosity as a Function of DM Content and Bulk Density



Bunker Silo Density Calculator

http://fyi.uwex.edu/forage/harvest/



Goal: Minimum bulk density: 44 lbs./ft.^{3}

Recommendations for Density in Bunkers and Piles

- Minimum bulk density: 44 lbs./ft.^{3}
- Packing tractor(s)
  - Heavy
  - Robust transmission with shuttle shift
  - Blade or bucket
  - Roll-over protection with seat belts
  - 4-Wheel drive or assist
  - Well-lugged tires
- Experienced operators

Recommendations for Density in Bunkers and Piles

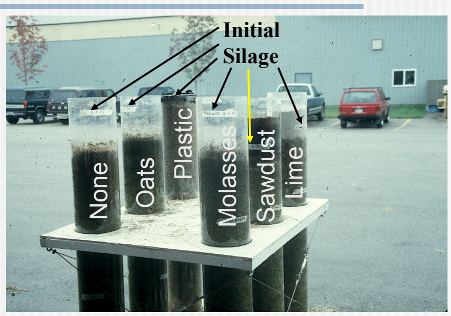
- Progressive wedge
- Thin layers (6 in.)
- Pack continuously
- Uniform coverage
- Drive slowly
- Avoid wheel slip

Packing Operation

With multiple packing tractors, have a plan to work together, avoiding accidents

SEALING

No Good Alternative to Plastic



Types of Plastic

- Polyethylene
  - Varying thicknesses, 4 to 8.5 mil
- Oxygen barrier films
  - Film with 10% or less of the oxygen permeability of polyethylene sandwiched between layers of polyethylene
- Polyethylene cling films, 1 to 2 mil

Polyethylene vs. Oxygen Barrier

- DM losses within 6 in. of the film:
  - 8.5 mil polyethylene ≈ oxygen barrier
  - 6 mil polyethylene: 5 points greater loss
  - 4 mil polyethylene: 10 points greater loss
- Fermentation quality
  - Oxygen barrier better than 8.5 mil poly

Fermentation Products at the Top of Two Bunkers – 8.5 mil White vs. Oxygen Barrier Film

	Depth, in.	pH	Lactic Acid	Acetic Acid	L:A
Haylage					
White	0-6	4.89	2.5	4.0	0.6
Silostop	0-6	4.82	4.5	2.2	2.1
White	6-12	4.82	4.5	1.7	2.6
Silostop	6-12	4.75	3.8	1.4	2.7
Corn					
White	0-6	4.02	3.2	1.6	2.0
Silostop	0-6	3.98	3.0	1.2	2.6
White	6-12	4.00	4.1	1.4	2.9
Silostop	6-12	3.97	3.9	1.2	3.1

Consistently better fermentation quality under Silostop even though no difference in DM loss.

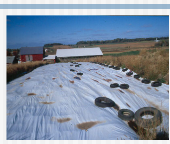
Is Clinginess a Valuable Trait for Covering Bunkers, Piles?

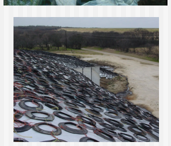
- I haven't seen good comparisons yet.
- Adding a cling film to a standard polyethylene sheet should reduce losses.

Equal Prevention of Spoilage?

- Left: two layers of white plastic and still pitching about 6 in. of spoiled silage
- Right: one layer of white plastic; no visible mold
- Moral: securing the plastic well is equally as important as choosing a good film.

How Many Tires Are Enough?



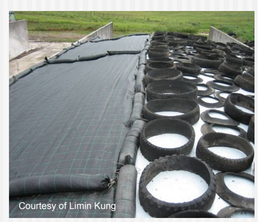


Enough to keep the plastic from billowing in the wind.

Photos courtesy Brian Holmes, Chuck Grimes

Alternative to Tires

- Woven or mesh tarps anchored with gravel bags
  - At wall
  - At seams in plastic, tarps



Bunker, Pile Covering Problem

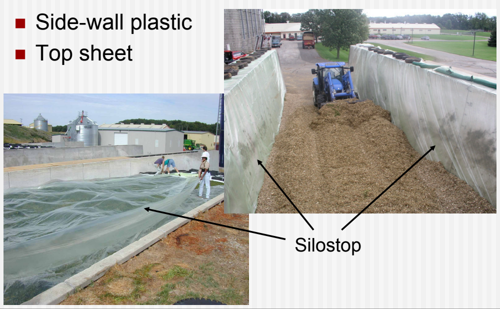
- Sides too steep to hold tires in place
- >3:1 (length:height) slope for safe packing and holding tires in place

Bunker Covering Problem

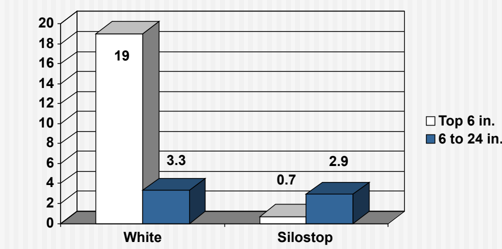
- Shoulder spoilage
- For a 100 ft. long, 10 ft. bunker wall: 10 tons dry matter within 12 in. of both walls

Reduced Shoulder Spoilage Using Side-Wall Film

- Side-wall plastic
- Top sheet



Estimated % DM Losses near the Wall - 2 Alfalfa Bunkers



Reduced spoilage near the wall in top 6 in. with Silostop system using side-wall film vs. 8.5 mil white film applied only on the top.

The Plastic's Secure. Can't I Relax?

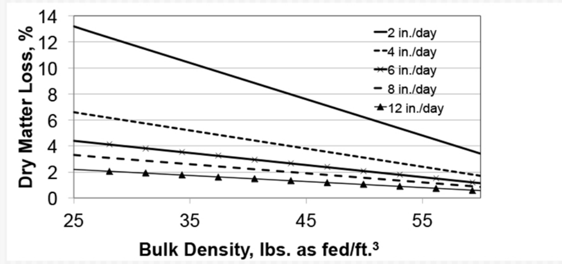
- A major contributor to losses are holes in plastic
- Scout routinely
- Patch with tape made for the plastic

FEED OUT

Goal in Unloading Silos

- Minimize oxygen exposure
- In a well-packed bunker or pile, oxygen moves back approx. 3 feet from face.
- So at 6 in./day removed from the face, silage is exposed to oxygen for 6 days before the cows get the silage.

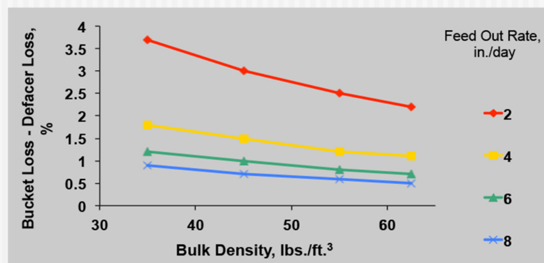
Losses at Feed Out



Feed Out Face

- Smooth
- No loose piles at the bottom to heat overnight

Defacer vs. Bucket: Smooth vs. Rough Face



Muck & Rotz, 1996

Value of a Smooth Face

- Assume:
  - 1% reduction in DM loss (i.e., already good feed out rates)
  - 25 lbs. silage DM/cow/day
  - $200/ton DM
- Savings: ~$9.00/cow/year

Silage Additives

Primary Roles of Additives

- Improve silage fermentation
- Enhance aerobic stability
- Avoid a clostridial fermentation

Homolactic Acid Bacteria

- Shift fermentation to lactic acid
- Lower pH
- Helps avoid clostridial fermentation
- Reduces DM losses
- Some strains have improved milk production more than others but not exactly sure why.

Homolactic Silage Inoculants – ROI

- Improved DM recovery, 2-3% on average
  - Treat 1000 tons as fed: $1000
  - Save 25 tons as fed
  - If each ton saved is worth $60 or more, ROI = 1.5
- Improved animal performance 3-5% when effective
  - Assume 3 lbs. milk/cow/day when effective
  - If effective 50% of the time, 1.5 lbs. milk/cow/day
  - With milk at $16 per 100 lbs., $0.24 extra income/cow/day
  - If cow is eating 60 lbs. silage as fed/day, then inoculant cost is $0.03/cow/day.

Lactobacillus buchneri

- Heterolactic acid bacteria
- Ferments lactic acid to acetic acid
- Improves aerobic stability
- Alternative to the long-standing chemical approaches: propionic acid, acetic acid, potassium sorbate, sodium benzoate

L. buchneri Inoculants – ROI

- Improved DM recovery, 1-2% on average
  - Treat 1000 tons as fed: $1500
  - Save 15 tons as fed
  - If each ton saved is worth $60, DM recovery alone won't pay for using the product: $900 benefit at a cost of $1500.
- Improved animal performance
  - If silage would be cool normally, **no** animal benefit to using
  - If silage would be heating normally, assume a 4 lbs. DM reduction in TMR intake and a 3 lbs. loss milk/cow/day
  - Avoidance of heating gives $0.48 more milk income/cow/day with $16 milk at a cost of ~$0.045/cow/day, for a cow eating 60 lbs. as fed silage.

Combination Inoculants

- L. buchneri or L. brevis plus homolactic acid bacteria
- Improve silage fermentation and aerobic stability
- However, not for avoiding a clostridial fermentation

Combination Silage Inoculants - ROI

- Most expensive inoculants, ~ twice that of standard homolactic inoculants
- So DM recovery won't be enough to cover the cost of these products
- A positive ROI depends on getting more milk.

Which Additive Should You Use, If Any?

Which Additive Should You Use?

Choice of additive depends on:

- Crop to be ensiled
- Goals

Goals An Additive May Address

- Aerobic stability problems
- Making a good silage better
- Avoiding a clostridial (butyric acid) silage

Aerobic Stability Problems

- Is the problem a management problem that can be solved without an additive? – density, feed out rate, sealing
- Corn Silage:
  - *L. buchneri* is a good alternative to propionic acid or other chemicals
    - Safer to handle
    - Competitive cost
    - Similar effects on DM recovery, animal performance
    - If you have multiple silos, use only on the silage to be fed in warm weather

Aerobic Stability Problems

- High Moisture Corn:
  - *L. buchneri* is a good alternative to propionic acid
  - However, if HMC is <25% moisture, inoculants less likely to succeed; propionic acid would be a better choice

Aerobic Stability Problems

- Alfalfa:
  - Below 45% DM, stability problems are almost always related to management issues
  - Above 45% DM, you have a number of options:
    - Feed out in winter
    - Homolactic inoculants for sporadic warm weather issues should make small improvements in stability
    - *L. buchneri* or combination products for more consistent warm weather issues

Issues with L. buchneri

- However, slow grower that takes 45-60 days storage time before having much effect
- So, not an answer to heating problems with immature silage; propionic acid is the best solution for this case
- Not a solution at feeding time

Make a Good Silage Better

Homolactic inoculants are the best route to improve DM recovery, animal performance

- Good fit for hay crop silages, HMC
- Best success under:
  - Good harvesting conditions
  - Very good silo management

Make a Good Silage Better

- Corn Silage:
  - Homolactic inoculants can reduce aerobic stability
  - Inconsistent success rate
  - Best fit: silage to be fed in cool weather
- HMC:
  - Much higher success rate than corn silage
  - Best fit: HMC to be fed in cool weather

Avoid a Clostridial Fermentation

- Typical situations where a clostridial fermentation is possible:
  - Rain-damaged hay crop
  - Ensiling hay crop on the wet side to avoid rain damage

Steps to Avoid Clostridial Silage

1. Use a homolactic bacterial inoculant to get pH as low as possible
2. Ensile separately in a pile or bag
3. Feed out early. Start 2-4 weeks after ensiling before clostridia become established.

Issues with Any Additive

- Application rates below the recommended level compromise the effectiveness of the product.

Issues with Any Inoculant

- These products work only if the bacteria go on the crop alive!
  - Store them properly: generally cool and dry
  - Don't use chlorinated water to dilute unless the chlorine level is less than 1 ppm
  - Watch out for high temperatures (> 100°F) in inoculant tank on chopper
- These bacteria cannot move around; they depend on you to spread them uniformly

Summary of Keys to Improve Silage Quality

- Packing
  - Minimum bulk density of 44 lbs./ft.^{3}
- Sealing
  - High quality film held tightly to crop, patched regularly.
- Feeding
  - Design silos/piles for feed out rates of 12 in./day
  - Defacer improves DM recovery by 1 or more percentage points by making a smooth face.

Summary of Keys to Improve Silage Quality

- Steps to avoid heating silage
  - Review silage management first and correct.
  - Use chemical additive or L. buchneri inoculant.
- Making a good silage better
  - Use a homolactic inoculant except for corn silage, HMC to be fed in summer.
- Steps to avoid clostridial silage if ensiling too wet
  - Ensile separately using a homolactic inoculant.
  - Begin feed out within a month of ensiling.

Questions?

U.S. Dairy Forage Research Center

New Milk Analysis Technologies to Improve Dairy Cattle Performance

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Department of Food Science Cornell University, Ithaca, NY

February 16, 2017

Outline

- Current Status of Precision Management Milk Testing.
- What Do Farmers Want?
- An example of connecting analytical measures to meet dairy farmer needs.
- Future Directions
  - Farm management and sustainability

Precision Management Milk Testing

- AfiMilk – Near IR – fat and protein combined with milk weight. Built into the milking system.
- Antibiotic testing (rapid milk testing).
- Mid-IR for milk components and milk SCC: done on some large farms with traditional laboratory testing equipment. Normally manual instruments are used.

What Do Dairy Farmers Need?

Dairy farmers need analytical results that will help them manage the efficiency of feed utilization, metabolic health during the transition period, mammary infection, animal welfare, environmental impact, and reproduction to improve economic performance and sustainability.

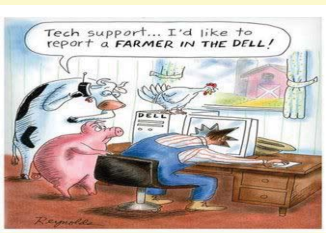
The success of farm management ultimately depends on correct decisions on an animal by animal basis. The challenge is to find the cow of interest, make a decision, and take action.

What Do Dairy Farmers Want?

Farms are getting larger, more technology (satellite technology, cloud based internet tools and information) and new tools are becoming available every day.

It is easy to be a bit overwhelmed by all of this.

In the end, milk production is all about the sum of the performance of all the individual cows. The farmer needs information upon which to make decisions, not data.



What Do Dairy Farmers Want?

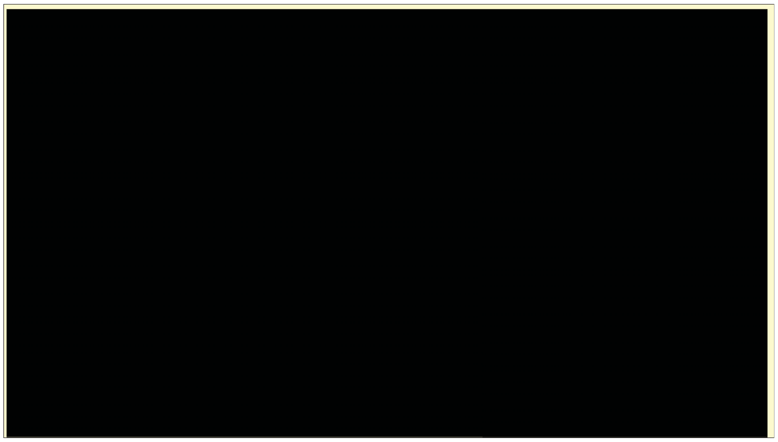
In the end, milk production is all about the sum of the performance of all the individual cows. The farmer needs information upon which to make decisions, not data.

So how can today's new technology be better harnessed to manage each individual cow?

Each cow needs to be a "Cow of Interest"

An interesting TV Program

“Person of Interest”



What Do Dairy Farmers Want?

Each cow needs to be a “Cow of Interest”

A tool that integrates diverse sources of data (e.g., milk analysis, activity monitors, cow side tests, etc.) to produce management information focused on optimization of the performance and economic return of each individual cow.

Outline

- Current Status of Precision Management Milk Testing.
- What Do Farmers Want?
- **An example of connecting analytical measures to dairy farmer needs.**
  - **Milk fatty acid composition**

Connecting with Dairy Farmer Needs

- **Overall Vision**

  Develop new tools in milk analysis for bulk tank and individual cow milks that will provide information to support decision making for management of feeding, health, and reproduction in dairy cows.

Objectives

1. To develop a new rapid analysis tool to measure fatty acid composition in a format that is useful for farm management.

Infrared (mid-FTIR) Milk Analysis

Manual FTIR currently used at Cornell and Collaborator Laboratories - Delta Instruments Model FTA, The Netherlands

de novo, mixed origin, and preformed fatty acids

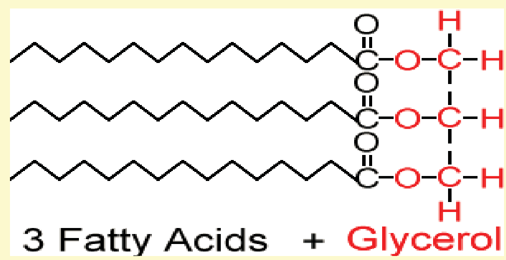
Fatty acid calibration was done once per month with reference milks produced at Cornell. The instrument tests about 50 to 70 samples per hour for all components, NPN/urea, and all fatty acid parameters. The automated model runs 600 samples per hour.

Connecting with Dairy Farmer Needs

Bulk Tank Milk Testing

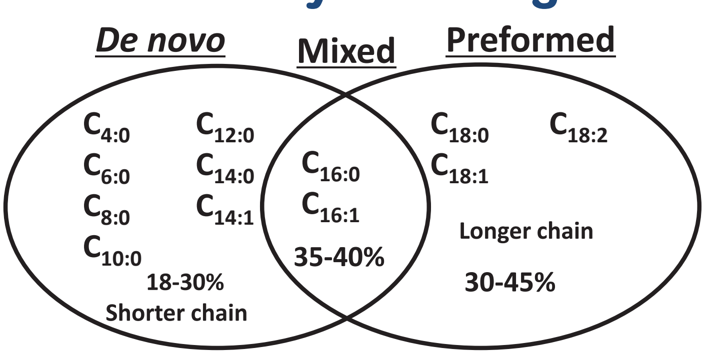
Efficiency of forage utilization (*de novo* fatty acids)

Milk Fat Structure

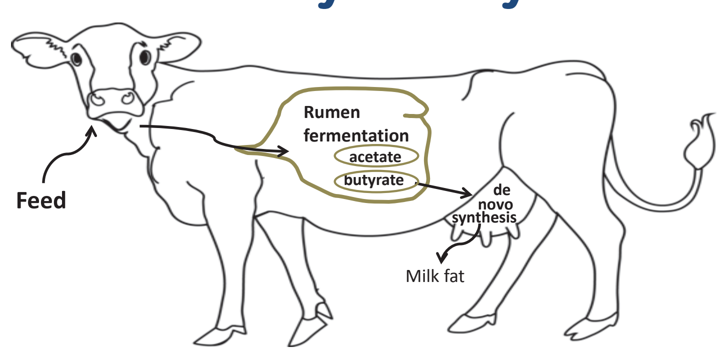


3 fatty acids per triglyceride

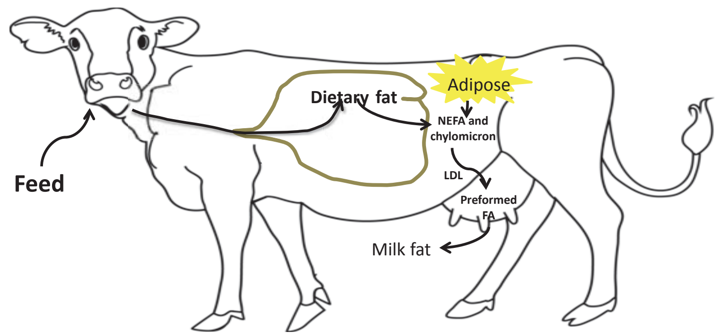
Milk Fatty Acid Origin



De novo Fatty Acid Synthesis



Preformed Fatty Acids



Objectives

1. To develop a new rapid analysis tool to measure milk fatty acid composition in a format that is useful for farm management.
2. **To determine how to use the milk fatty acid composition data on bulk tank and individual cow milk samples for feeding and health management of dairy cows.**

Conclusions from Preliminary Work: 430 farm survey of milk fatty acid composition for 2 years at the St Albans Cooperative in St Albans, Vermont. As de novo fatty acids in the bulk tank milk increased, the fat and protein concentration increased.

40 Farm Studies (2014 & 2015)

Collaboration: Cornell, Miner Institute, St. Albans Cooperative, Delta Instruments

1. **Sort all 430 farm data from low to high values for de novo fatty acids as a percentage of total fatty acids within the Jersey group of farms and within the Holstein group of farms for a field study in 2014.**
2. **Select 10 Jersey farms with low *de novo* and 10 Jersey farms that have high *de novo* fatty acids.**
3. **Select 10 Holstein farms with low *de novo* and 10 Holstein farms that have high *de novo* fatty acids.**
4. **In 2015, we repeated the study with 40 Holstein farms: 20 high de novo and 20 low de novo farms.**

Milk Composition: June 2012 – August 2013

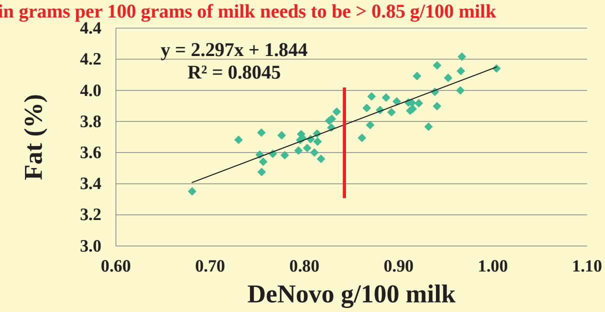
Mean relative milk fatty acid composition for each group of 10 farms for the 15 month period: *de novo*, mixed origin, and preformed fatty acids

St Albans — June 2012 through August 2013

Breed	Group	% Fat	% True Protein	g/100 g FA Denovo	g/100 g FA Mixed	g/100 g FA Preformed
Holstein	Low *DeNovo*	3.623	2.993	24.08	33.97	41.95
Holstein	High *DeNovo*	3.975	3.148	26.08	35.08	38.84
Jersey	Low *DeNovo*	3.917	3.093	25.04	33.35	41.61
Jersey	High *DeNovo*	4.804	3.616	27.41	34.62	37.96

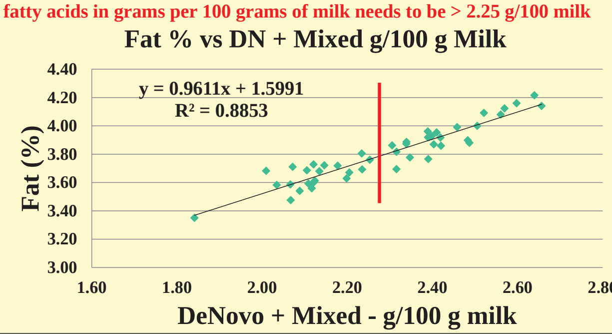
40 Holstein Farms 2015
St Albans - Fat

If you want a fat test > 3.75% fat in bulk tank with Holsteins, then the de novo fatty acids in grams per 100 grams of milk needs to be > 0.85 g/100 milk

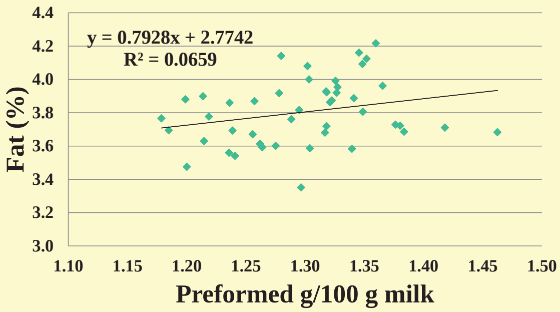


40 Farms Holstein Farms 2015
St Albans - Fat

If you want a fat test > 3.75% fat in bulk tank with Holsteins, then the denovo + mixed fatty acids in grams per 100 grams of milk needs to be > 2.25 g/100 milk

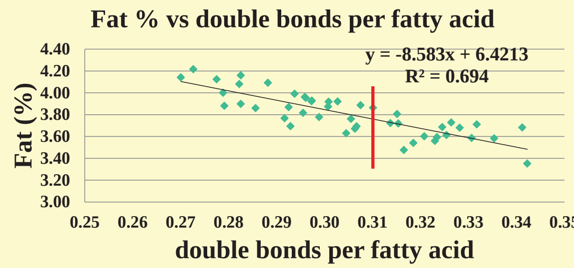


40 Holstein Farms 2015
St Albans - Fat



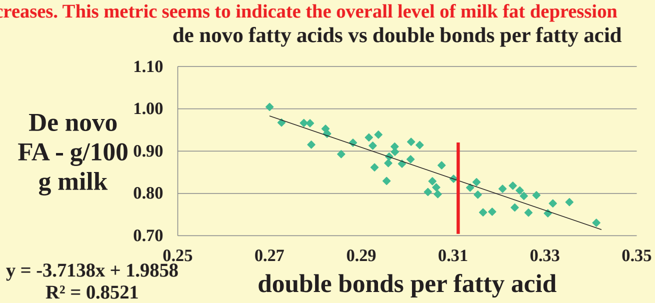
40 Holstein Farms 2015
St Albans - Fat

If you want a fat test > 3.75% fat in bulk tank with Holsteins, then the double bonds per fatty acid in milk fat needs to < 0.31.

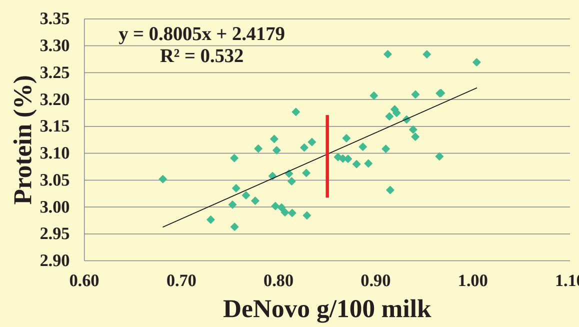


40 Holstein Farms 2015
St Albans – Milk Fat Depression

As double bonds per fatty acid increases in milk fat, the output of de novo fatty acids decreases. This metric seems to indicate the overall level of milk fat depression



40 Holstein Farms 2015
St Albans - Protein



Bulk Tank "Alarms" for Holstein Herds

Milk Component	Units	Alarm Value
Fat	%	< 3.8%
De novo fatty acids	g/100 g FA (relative %)	< 23%
	g/100 g milk	< 0.8
Mixed fatty acids	g/100 g FA (relative %)	
	g/100 g milk	< 1.3
Preformed fatty acids	g/100 g FA (relative %)	> 38-40%
	g/100 g milk	< 1.3
Fatty acid unsaturation	double bonds/FA	> 0.31

Results of 40 Farm Study Year 1

- *Half Holstein Herds and Half (Jersey – mixed breed)*
- *De novo* FA as a % of total fatty acids (25.6 vs 23.7% relative %, *P*<0.01)
- Milk (26.3 vs 22.7 kg/d, *P*=0.06),
- Fat (4.33 vs 4.14%, *P*=0.10),
- True protein (3.41 vs 3.22%, *P*<0.01)
- MUN (11.4 vs 11.3 mg/dL, no significant difference)
- These differences for fat and protein between HDN and LDN herds at 25 kg of milk per 100 cows per year would result in a gross income difference of $8,544 for fat and $15,695 for protein.

Results of 40 Farm Study Year 2

- All herds were Holstein
- *De novo* FA as a % of total fatty acids (26.0 vs 23.8% relative, significant $P < 0.01$)
- Milk (31.9 vs 32.1 kg/d, no significant difference),
- Fat (3.98 vs 3.78%, $P<0.01$),
- True protein (3.19 vs 3.08 %, $P<0.01$)
- MUN (12.1 vs 12.9 mg/dL, no significant difference)
- These differences for fat and protein between HDN and LDN herds at 30 kg of milk would result in a gross income difference of $9,125 for fat and $6,935 for protein per 100 milking cows per year.

Factors Related to De novo Fatty Acid Synthesis

Less feed bunk space per cow (i.e., < 46 cm, or < 18 inches) was related to lower de novo fatty acids and lower fat and protein test.

Higher stall stocking density in pens (i.e., > 1.1 cows per stall) was related to lower de novo fatty acids and lower fat and protein test.

Higher average ether extract in the ration for lower de novo fatty acid farms.

Higher peNDF as a % of DM for the high de novo fatty acid farms (26.8 vs 21.4%) ($P < 0.01$)

Main Conclusions from Bulk Tank Milks

The strongest correlation between milk fatty acid composition and the concentration of fat and protein in milk was with *de novo* fatty acid production.

De novo fatty acid level seems to be barometer of rumen health and proper rumen function.

Thus, feeding and farm management strategies that produce an increase in synthesis of *de novo* fatty acids may produce an increase milk fat and milk protein percentage and possibly output of fat and protein per cow per day.

Even more information may be gained by measuring the fatty acid composition of milk from individual cows.

Outline

- What Do Farmers Want?
- What Do Processors Want?
- An example of connecting analytical measures to dairy farmer needs.
  - Milk fatty acid composition
  - Blood NEFA estimated from milk analysis

Objective

To develop and validate a Fourier transform mid-IR-based milk analysis method to estimate blood NEFA concentrations for lactating dairy cows.

Connecting with Dairy Farmer Needs

- Transition Cow

Calving: going from negative energy balance to positive energy balance (weeks 1 to 10 of lactation)

Measures: feed composition, activity monitor data, milk fatty acid composition, blood NEFA, blood BHB, milk BHB, acetone, milk weight, body weight, automated video observation. New data available every day.

Challenge and Opportunity: Integrate all of this into actionable information in real-time.

Comparison of blood and milk NEFA results

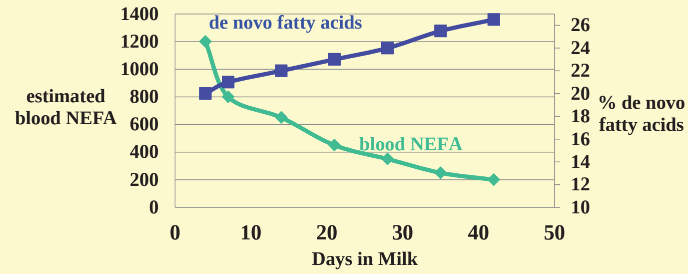
The NEFA concentration measured in blood represents the concentration at an instant in time. The level can vary with time and with the level of stress of the individual cow at the time of blood sampling.

It is hypothesized that the blood NEFA concentration estimated from milk represents the time average status of blood NEFA for full period of time between milkings.

Therefore, the estimate for blood NEFA based on milk analysis may be a more stable and integrated estimate of the status of a cow's blood NEFA level for a period of time than the estimate obtained from a blood sample.

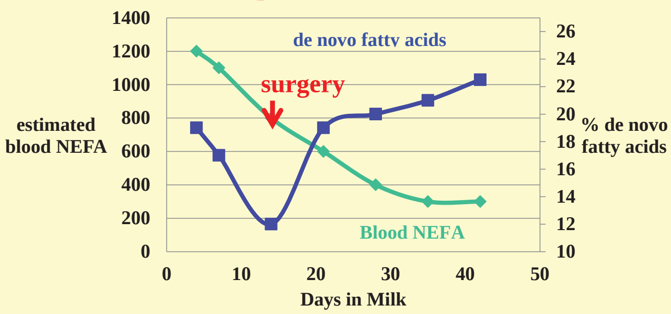
Sample Individual Cow Data

Cow with high body condition at calving with good liver function



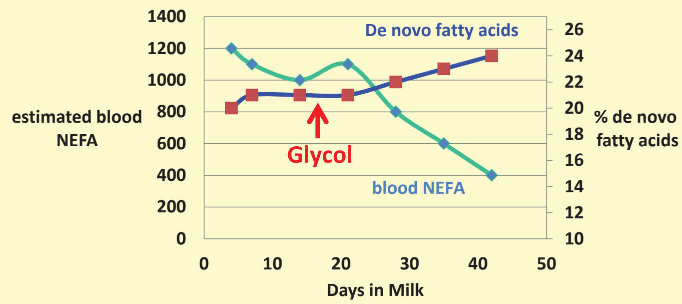
Sample Individual Cow Data

displaced abomasum



Sample Individual Cow Data

cow with ketosis



Conclusion

- **The milk estimated blood NEFA and milk fatty acid data correlated well with documented ketosis and displaced abomasum (DA), but more data is needed.**

Outline

- Current Status of Precision Management Milk Testing.
- What Do Farmers Want?
- An example of connecting analytical measures to meet dairy farmer needs.
- **Future Directions**

Future Directions – Milk Production

Management Indices on Individual Cows

Blood Chemistry Measures (done on MILK!!! Every milking???)
- Blood NEFA
- Blood BHB
- Milk urea nitrogen (MUN)
- Stress/inflammation compounds?
- others – related to reproduction??

Used: Milk Fat Depression, Predict Ketosis, DA, acidosis, and reproductive performance

Rumen Function
- prediction of rumen pH?

Future Directions

What is next?

Coming to a Dairy Nutrition Conference Near You!

October 2018

Caladriel

Riddle Number 1

What has roots as nobody sees,
Is taller than trees,
Up, up, up it goes,
And yet never grows?

Dandolf the White

Acknowledgments

The lab staff at St. Albans Cooperative for infrared milk testing of fatty acid composition of bulk tank milk of 430 farms over 4 years and Miner Institute (R. Grant, H. Dann, M. Woolpert and many others) for individual cow milk and blood samples.

Delta Instruments for technical support in development of calibration models.

The USDA Federal Milk Markets for support of the development of improved milk testing methods.

Shawn Landersz for "Cow of Interest" video production.
www.landersz.com

Questions??

Choosing the Right Liquid Feed for Your Calves

Taylor Yohe
PhD candidate
Virginia Tech
2/16/17

Department of Dairy Science at Virginia Tech · dasc.vt.edu

1

Why Feed Liquid Diet?

- Big picture question
- Could we feed a newborn calf a diet of only starter and hay for the first few weeks of life?


2

Why Feed Liquid Diet?

- Simple answer:
  - No! Calves need milk!
- More complex answer:
  - Abomasum ready for nutrient digestion
  - Rumen not developed for digestion and absorption
  - Calves won't be eating much solid feed anyway!

3

Voluntary Starter Intake

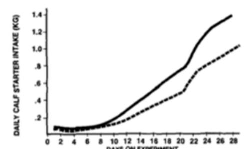
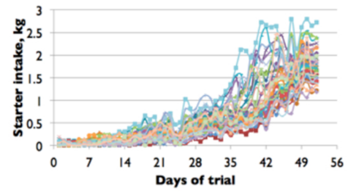


Figure 4. Daily calf starter intake for 335 calves averaging less than (▪ ▪ ▪) or equal to or greater than (▬) 272 g daily gain.

Kertz et al., 1984

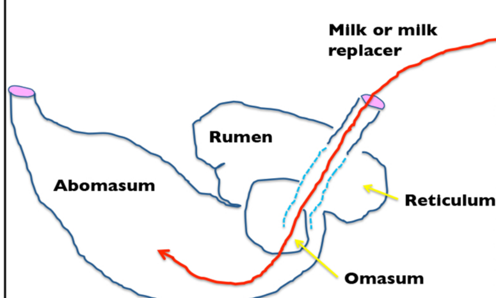


Yohe et al., 2015

- Low intake for first 2-3 weeks of life

4

Reticular Groove Closure



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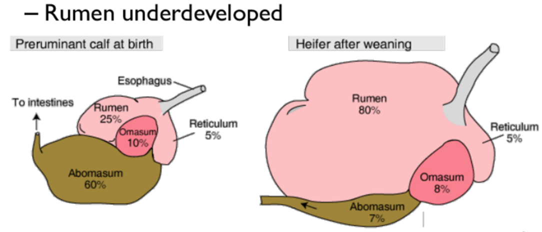
Importance of Liquid Diet

- Preweaned calf:
  - Main source of energy and protein
  - Rumen underdeveloped



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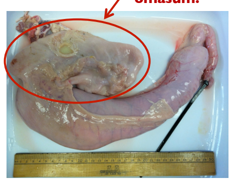
Undeveloped Rumen

- 1 day old calf rumen



Undeveloped Rumen

- There's a reason we call it "starter"

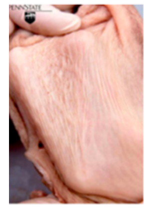


Fig. 1. Milk only.
Penn State Extension

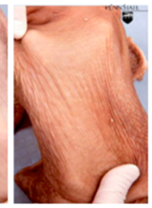


Fig. 2. Milk and hay.
Penn State Extension


Fig. 3. Milk and grain.
Penn State Extension

Liquid Feed Options

- Milk
  - Saleable
  - Nonsaleable/waste (pasteurized)
  - Acidified
- Milk replacer (**MR**)
  - Many formulations (protein:fat, ingredients)
  - Acidified

Saleable Milk

- High quality milk that is considered good enough for human consumption
- Taken straight from bulk tank

Saleable Milk

Milk	DM%	Fat%	Prot%	Lactose	Ash%
Holstein	12.5	3.6	3.0	5.0	.7
Jersey	14.5	5.0	3.8	5.0	.7

Compare whole milk on a powder basis?

Liquid feed	DM %	Fat%	Protein %
Holstein	100	28.8	24
Jersey	100	34.5	26.2

Saleable Milk

- Pros:
  - Highly nutritious (24-27% protein, 28-36% fat DM)
  - Should not be limited in supply
  - "Lactocrine hypothesis"
- Cons:
  - Takes away from producer's milk sales

Lactocrine Hypothesis

- Milk-borne factors that may influence development and function of tissues via epigenetic factors

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Nonsaleable/Waste Milk

- Can include:
  - Nonsaleable transition milk
  - Nonsaleable/waste milk from cows treated with drugs that have withdrawal periods
- Lost economic opportunity for dairy farmers
- Potential for negating loss via feeding to calves

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Nonsaleable/Waste Milk

- Pros:
  - Typically a good source of nutrition
  - Economically a good choice
  - Also fits lactocrine hypothesis
- Cons:
  - Nutritional variability
  - Variable supply
  - Should have system for pasteurization (expensive)
  - Potential large pathogen load
  - Big question regarding antibiotic resistance?

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Milk Replacer

- Manufactured to replace whole milk using multitude of different ingredients
- Typically marketed as:
  - %Protein:%Fat
  - Dry matter basis
  - 20:20, 22:20, 26:20, 27:10

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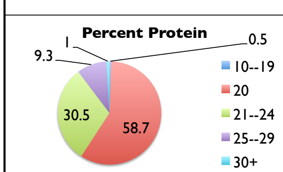
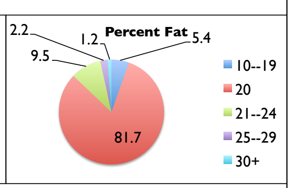
Popular Milk Replacers

- Most popular form of liquid feed for calves
- 2014 NAHMS data: % of operations that fed MR





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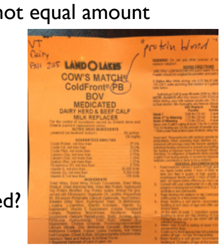
Reading Milk Replacer Tag

- Important considerations:
  - Order of ingredients does not equal amount
  - Protein source(s)
  - Fat source(s)
  - *Medicated or nonmedicated?



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Protein sources for liquid feeds
(BAMN, 2014 Publication)

Acceptable milk ingredients	Acceptable nonmilk ingredients	Not acceptable
Dried whey protein concentrate	Soy protein isolate	Meat solubles
Dried skim milk	Protein modified soy flour	Fish protein concentrate
Casein	Soy protein concentrate	Wheat flour
Dried whey	Hydrolyzed soy protein modified	Soy flour
Dried whey product	Animal plasma	Egg products
	Wheat gluten or isolate	

Protein is the most expensive ingredient in liquid feed for calves

Digestibility

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Milk Replacer

- Pros:
  - Many different nutrient and ingredient options
  - Consistent product
  - Potentially fits lactocrine hypothesis as well
- Cons:
  - Ingredient digestibility variable
  - Can be costly depending on what type and competing markets for ingredients

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Milk Replacer Considerations

- New FDA Regulations effective 1/1/17
  - Veterinary Feed Directive (**VFD**) required for "medically important" drugs
  - Does not affect other feed additives:
    - Ionophores (Lasalocid, Monensin)
    - Coccidiostats (Decoquinate)
  - Main antibiotics in MR that will be affected:
    - Chloretetracycline
    - Oxytetracycline
    - Oxytetracycline & Neomycin

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Acidified Milk/Milk Replacer

- Effective means of preserving milk/MR without needing refrigeration
- Use of acid (e.g. citric, propionic) to preserve milk by preventing microbial growth
  - pH 4.5-5 suggested
- Helpful Penn State info regarding acidified MR
  - http://extension.psu.edu/animals/dairy/news/2014/feeding-acidified-milk-to-calves

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Acidified Milk/Milk Replacer

- Pros:
  - Nutritionally good option
  - Effective method for short term preservation
- Cons:
  - Must use acid, which may be dangerous
    - FDA approved citric, propionic acid, but not formic!
  - Increased management to safely use

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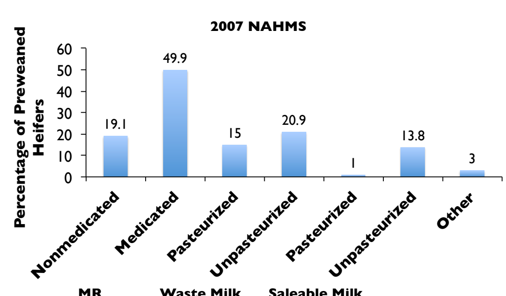
What Have Producers Fed?



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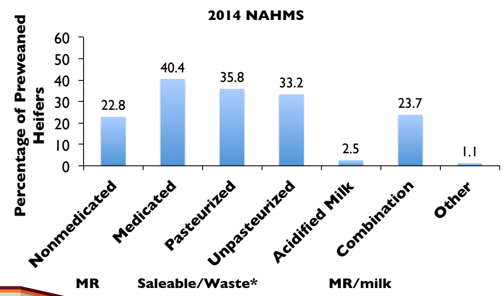
What do Producers Feed?



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Future Implications?

- MR still probably most used liquid feed
  - Medicated continue to decline
- An increase in usage of pasteurized waste milk
  - As long as no restrictions are imposed
- Automatic calf feeders adapting to different liquid feed sources

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PennState Extension

Cost Comparison of Milk Replacer vs Whole Milk

WHOLE MILK INPUT		
Mailbox milk price (value of milk sold, $/cwt)	16.40	*from milk check*
Total solids content of milk (%)	12.5	*if not on milk check, enter 12.5*
True protein content of milk (%)	3.2	*from milk check*
Fat content of milk (%)	3.5	*from milk check*
Weight of whole milk to feed calves (lb/d)	12.0	*enter the weight of liquid; 1 gal = 8.6 lb*
MILK REPLACER INPUT		
Cost of milk replacer per bag ($)	60	
Weight of milk replacer bag (lb)	50	
Dry matter content of milk replacer (%)	96.5	*may range from 96 to 98*
Crude protein content of milk replacer (%)	20	*from milk replacer feed tag*
Fat content of milk replacer (%)	20	*from milk replacer feed tag*
Weight of milk replacer fed to calves (lb/d)	1.5	*weight of powder, not liquid*

OUTPUT

	Whole Milk	Milk Replacer
Crude protein (% dry matter)	27.1	20.7
Fat (% dry matter)	28.0	20.7
Cost per pound of dry matter	$1.31	$1.24
Cost per 50 lb of dry matter	$66	$62
Dry matter fed per calf (lb/d)	1.50	1.45
Crude protein fed per calf (lb/d), DM basis	0.41	0.30
Fat fed per calf (lb/d), DM basis	0.42	0.30
Cost per calf per day ($/calf/d)	$1.97	$1.80

http://extension.psu.edu/animals/dairy/nutrition/calves/feeding/spreadsheet-to-compare-cost-of-milk-and-milk-replacer/view

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What Does This Mean?

- This scenario:
  - $0.17 more per calf per day to feed whole milk
  - Assuming 8 week weaning = $9.52 per calf
- Is it worth it to pay that extra amount per calf?

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Maybe So

- Study fed differing amounts of pasteurized whole milk at 26.7% CP and 31.7% fat (Rosenberger et al., 2017)

Fed @ 12% solids	Preweaning ADG g/d (lb/d)
5.7 L/d (~13 lb/d)	580 g/d (1.28 lb/d)
8.3 L/d (~19 lb/d)	650 g/d (1.43 lb/d)
9.4 L/d (~21 lb/d)	880 g/d (1.94 lb/d)

- Decreased preweaning starter intake
  - 300 g/d @ 5.7 L/d milk vs. 50 g/d @ 9.4 L/d milk

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More to Consider

- 2016 meta-analysis (Gelsinger et al., 2016):
  - 500-900 g/d (1.1-1.98 lb/d) preweaning ADG linked with enhanced first lactation performance
- Included milk/MR and starter intake
  - Calves consuming ≥ 100 g of starter (on DM basis) expected to produce 127 kg (280 lb) more milk vs. calves consuming no starter preweaning
- Suggested synergistic effects of milk/MR + starter

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Do I Need to Feed Whole Milk?

- Not necessarily
- What are some comparable options?
  - Pasteurized nonsaleable/waste milk
  - Enhanced/accelerated MR

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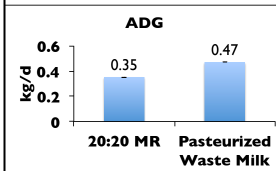
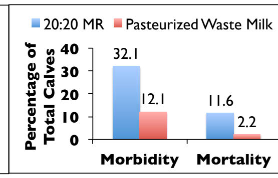
Pasteurized Waste Milk vs. MR

- Calves given:
  - Pasteurized waste milk (n=223)
  - MR 20:20 (n=215)





(Godden et al., 2005)

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Other Findings from Study

- Saved $0.69/calf/day ($34 from birth to weaning)
  - Savings from not purchasing MR and less treatments
- Important to note:
  - Didn't analyze pasteurized whole milk for nutrients
  - Estimated 25.6% crude protein and 29.6% crude fat

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Can We Rely on Waste Milk?

- It's an interesting question
- Too much is a sign of questionable herd health
- Is it actually safe to feed?
  - Bacteria still shown to be present
  - Antibiotic residue still present as well

H. Littier MS Thesis

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What about Milk Replacer?

- Cornell study (Soberon et al., 2012) found feeding elevated amounts of MR (4.5-5.3 Mcal of ME/d of 28:15 or 28:20) lead to:
  - high ADG preweaning (approx. 1.6 lb/d)
  - Increased first lactation milk production
    - Each additional 2.2 lb of ADG preweaning lead to an increase of 2,138 lb in first lactation milk production
- How much 20:20 MR would be needed to reach that ADG? Would it be lean or fat growth?

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What About Acidified Milk/MR?

- Recent study (Todd et al., 2017) compared ad libitum access to acidified MR vs. restricted MR feeding (6 L/d)
  - MR used for both treatments = 24:18
- Increased preweaning ADG for acidified (1.3 lb/d vs 0.948 lb/d)
  - when checked at 8 mo. of age no difference in BW or ADG
- Also, no differences in morbidity or mortality

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More on Acidified Milk/MR

- Decent alternative option if necessary
- Safety hazard handling acids
  - No formic acid!
  - Must be careful to keep pH in acceptable range (4.5-5)
- Acid should only be added to cooled milk (68-75°F)
  - Temp above 75°F may start to cause curdling
- Feeding of acidified MR at ambient temperature
  - Ideally liquid feed should be at or close to body temp

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Combining Liquid Feeds

- Potentially the most useful way to effectively and efficiently use your resources
- System where pasteurized waste milk can be used and if not enough then a combination of whole milk/MR can be used
- Use of milk balancer products

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Other Important Factors

- Enhanced nutrition preweaning (whole milk or MR)
  - Increased mammary gland development
  - Lactocrine hypothesis
  - Decreased rumen development
    - Can potentially be mitigated via stepdown weaning
- Management important for any feeding regiment

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Main Takeaways

- Many good options for liquid diets to feed calves
  - Stay away from unpasteurized waste milk!
- Pasteurized waste milk a decent option
  - At the moment unaffected by VFD
- Feeding as close to whole milk with lower fat best option
  - MR with high protein (25-28%) and low to mid fat (10-20% depending on season) with digestible nutrients good option

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Benchmarks to Consider

- Preweaned calves:
  - ADG > 650 g/d (1.43 lb/d)
  - <10% treated for respiratory disease
  - <15% treated for scouring
- Method for helping to achieve benchmarks:
  - ≥ 8 L/d (approx. 8.5 quarts) milk or MR fed daily @ 12-12.5% solids
    - With protein (25-28%) and fat (10-20%) depending on season

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Useful Tools

- Penn State Extension website
  - spreadsheet to assess costs of whole milk vs MR options
    - http://extension.psu.edu/animals/dairy/nutrition/calves/feeding/spreadsheet-to-compare-cost-of-milk-and-milk-replacer/view
- Calfnotes.com (Dr. Jim Quigley of Provimi NA)

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Thanks!

- Questions?

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Use of High-Concentrate or High Forage Diets for Transition Dairy Cows

Ric R. Grummer
Professor Emeritus
Department of Dairy Science
University of Wisconsin-Madison

Use of High-Concentrate or High Forage Diets for Transition Dairy Cows

Objective of today's presentation: a historical review of research on feeding energy to transition cows

- "Steaming up" close-up transition cows
- Controlled energy diets (Goldilocks, one diet for entire dry period)
- Postfresh transition cows (HOT, starch)

Origen of the Concept of Steaming Up Close-Up Transition Cows

Robert Boutflour at the World Dairy Congress (1928) first proposed the "steam up" ration as a way to circumvent "the neglect of the preparation of the cows for her lactation period". The term was meant to be an analogy to the preparation of a steam thresher.

"Steaming Up": Feeding Additional Grain During Final Weeks Prepartum?

- Adapt Microflora
- Grow Papillae
- More Energy
  - DMI
  - Energy Density
- Decrease Fat Mobilization

Conventional Dry Cow Feeding Stategy:

- Far-off dry cow
  - Low energy diet to maintain body condition score
  - NE_l = .63 - .68 Mcal/kg
  - Low quality forages acceptable
- Close-up dry cow diet
  - Increase grain feeding
  - NE_l = .70 - .72 Mcal/kg

Pre-fresh NFC??

Trial	NFC, % DM
Minor et al., 1998	35
	44
Mashek and Beede, 2000	35
	38
Keady et al., 2001	13
	28
Holcomb et al., 2001	25
	30
Doepel et al., 2001	24
	30
Rabelo et al., 2003, 05	38
	45
Smith et al., 2005	34
	40
Kamiya et al., 2006	28
	33
Guo et al., 2007	26
	39
Roche et al., 2010	13
	32
Zhang et al., 2015	21
	27
	34
Vickers et al., 2014	27
	33
Zhang et al., 2015	21
	27
	34

Summary of Results

- 8/10 Studies showed a significant increase in prepartum DMI.
- 0/9 Studies showed any significant effect on postpartum DMI.
- 0/11 Studies showed any significant effect on milk yield.
- 1/5 Studies showed a significant reduction in liver fat.
- Health and reproduction?????

Why After ~100 Years, We No longer Need to "Steam-up" Cows??

- TMR (elimination of slug feeding grain)
- Low feed intakes near the time of calving
- Gradual increases in concentrate consumption postpartum as TMR dry matter intake increases
- Exceptions??:
  - High straw (controlled energy) diets
  - Concentrate fed separate from forage
  - Situations in which energy requirements are not met (low feed intakes):
    - Poor facilities, heat stress, etc.

Message conveyed to the industry: You can feed one dry cow diet that contains high (poor quality) forage-low concentrate

Use of High-Concentrate or High Forage Diets for Transition Dairy Cows

Objective of today's presentation: a historical review of research on feeding energy to transition cows

- "Steaming" up close-up transition cows
- Controlled energy diets (Goldilocks, one diet for entire dry period)
- Postfresh transition cows (HOT, starch)

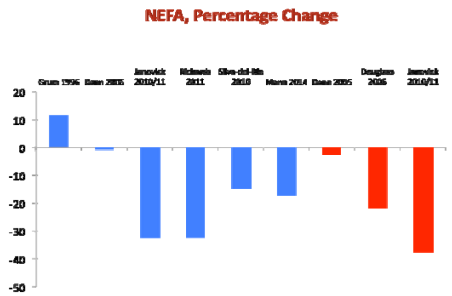
"Controlled" Energy Dry Cow Diets

- High in poor quality forage, typically straw
- Cows are less insulin resistant
  - Lower rates of lipolysis
  - Less fatty liver
  - Lower BHBA (less ketosis)
- Greater DMI postpartum (?)
- Fewer displaced abomasums
- Only need one diet for the dry period (?)

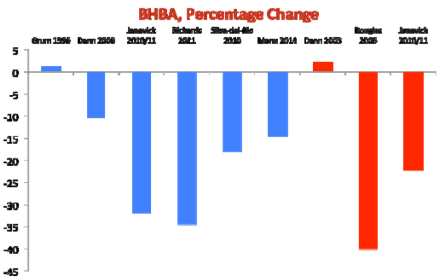
Two Experimental Approaches to Controlling Energy Intake of Dry Cows

- Ad libitum feed intake of a diet with very low energy density
  - Practical, can apply in the real world
  - Experimental treatments: Control "moderate" energy density diet vs low energy density diet, both fed ad libitum
  - Typically 150 vs 100% of cows energy requirement
  - Blue bars
- Restricted feed intake of a "moderate" energy density diet
  - Not practical in the real world
  - Experimental treatments: Control (ad libitum) vs restricted feed intake of "moderate" energy density diet
  - Typically 150 vs 80% of cows energy requirement
  - Red bars

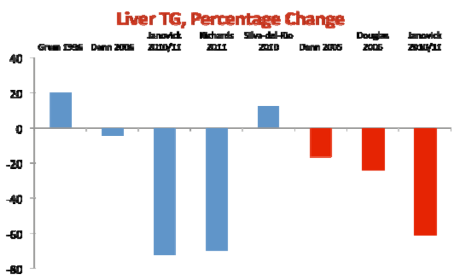
Response to Feeding Controlled Energy Diets



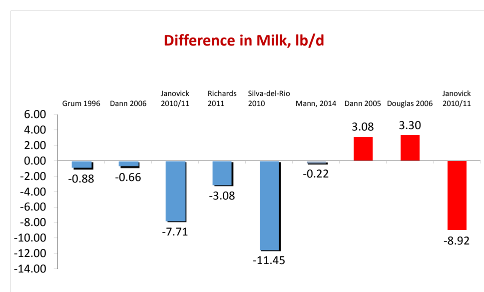
Response to Feeding Controlled Energy Diets



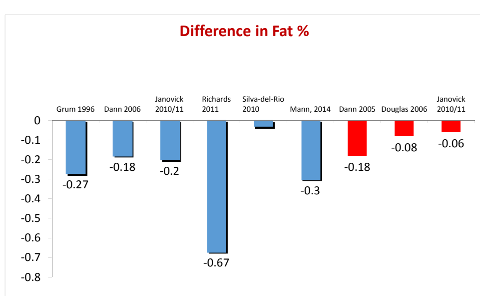
Response to Feeding Controlled Energy Diets



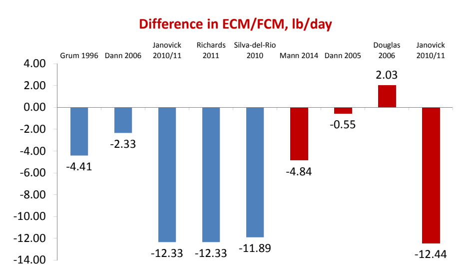
Response to Feeding Controlled Energy Diets



Response to Feeding Controlled Energy Diets



Response to Feeding Controlled Energy Diets



This Data Makes Total Sense!!!!

- Cows fed controlled energy diets mobilize less fat (NEFA)
- NEFA are used by the mammary gland
  - Energy source
  - Precursor for milk fat synthesis
- If you reduce NEFA availability to the mammary gland, it should not be surprising that there *may be* downstream effects on lactation performance
- The goal is to have a balancing act: provide sufficient NEFA to the mammary gland to support lactation without the cow experiencing negative effects that may result if NEFA mobilization is excessive.

Hmmmmmmmm.........

"Nutritional restriction to adipose tissue mobilisation might be necessary, but there is a philosophical problem. We have selected cows that have increased reliance on mobilised body reserves as a source of nutrients for milk production. The farmer has paid the geneticist for this- are we now going to ask him to pay the nutritionist to work in the opposite direction? We have our priorities wrong. We should explore what can be done to help the liver deal with mobilised fatty acids before considering whether we need to try to reduce the amount of fatty acid supplied to the liver."

J. R. Newbold. 2005. Liver Function in Dairy Cows. Recent Advances in Animal Nutrition

Conclusions/Questions- Controlled Energy Diets

- Feeding one diet for the entire dry period that does not exceed energy requirements will result in less fat mobilization and lower plasma NEFA, BHBA, and liver fat.
- Milk fat percentage is likely to be reduced and in a few trials milk yield has also been reduced.
- Optimum level of energy density has not been determined
- "Gut" feeling is that feeding to 100% (or less) of energy requirements may be too low to optimize postpartum lactation performance.

Conclusions/Questions- Controlled Energy Diets

- Do we still need a separate "close-up" diet for supplements?
  - Anionic salts
  - Yeast
  - Protected choline
- When feeding high straw (or other low quality forage quality), can cows benefit from "steaming up"
  - Pre or postfresh?

Use of High-Concentrate or High Forage Diets for Transition Dairy Cows

Objective of today's presentation: a historical review of research on feeding energy to transition cows

- "Steaming" up close-up transition cows
- Controlled energy diets (Goldilocks, one diet for entire dry period)
- Postfresh transition cows (HOT, starch)

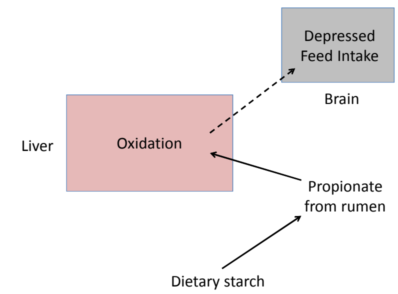
Lots of Questions Regarding Postfresh Energy!!

- Do you put cows right onto high group diet?
- Should you feed straw/low quality forage right after calving? Baled hay?
- Do we try and get cows to increase milk production as fast as possible or do we try and hold them back??
  - Does starting cows out on high group TMR push cows "too hard": DA, acidosis, severe negative energy balance, fatty liver, ketosis, poor reproductive performance
  - Or, does restricting energy intake exacerbate negative energy balance.............
- Starch levels????
- Amazingly, little research is available.

Starch Level and Energy Intake

- Potential benefits of increasing starch in postfresh diets
  - Increased energy density of diet
  - Greater energy intake
  - Greater milk yield
  - Less fat mobilization, metabolic disorders
- Negative effects
  - Displaced abomasum, acidosis
  - Some suggest increasing starch or fermentability of starch during the first few weeks postpartum reduces feed intake

"Hepatic Oxidation Theory: HOT"

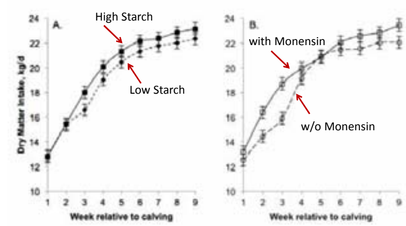


Starch Level/Monensin

(McCarthey et al., 2013)

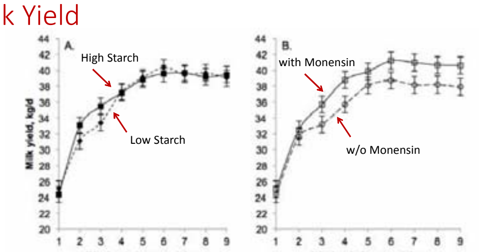
- 2 x 2 factorial
- 21.5 vs 26.2% starch weeks 1-3 postpartum
- With or without monensin (400 mg/d 3 wk pre to calving, 450 mg/d from d 0 to d 63 post)

Dry Matter Intake



McCarthey et al., 2013

Milk Yield



McCarthey et al., 2013

Starch Level??

Nelson et al, (2011)

- Hypothesis: Cows coming off a low energy dry cow diet may benefit from lower starch diets post-calving
- Treatments: Corn out, soybean hulls & wheat mids in

	Low	Medium	High
NDF, %	35.7	33.9	31.9
Starch, %	21.0	23.2	25.5
Rumen ferm. starch, %	16.8	18.9	20.2
Day 1-21	L	M	H
Day 22-91	L	H	H

Starch Level??

Nelson et al. (2011)

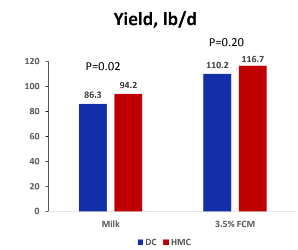
	L	M	H
DMI, kg/d	25.2^{x}	24.9^{xy}	23.7^{y}
Milk, kg/d	47.9^{ab}	49.9^{a}	44.2^{b}
Fat%	3.88^{x}	3.64^{y}	3.79^{xy}
NEFA, uEq/L	452^{y}	577^{x}	431^{y}

a,b (P<0.05)
x,y (P<0.10)

Corn Processing/Starch Fermentability??

Rockwell and Allen, 2016

- Design:
  - Dry Corn vs HMC
  - 26.5% starch
  - 0 to 28 DIM
  - Common diet from d28 to 84
  - n= 24 per treatment
- Results
  - No differences in DMI for first 28 days postpartum



Starch x Fermentable Starch

(Albornoz and Allen, JAM Abstr. 355, 2016)

- 2 x 2 Factorial arrangement of treatments
  - 22 vs 28% starch (corn replaced soy hulls)
  - High moisture corn (HMC) vs dry ground corn (DGC)
- 22% forage NDF, 17% CP
- Treatments d 1-23 postpartum, carry over d 24-72 (common 30% starch diet)
- DGC increased DMI 2.2 kg/d vs HMC during treatment period and effect diminished during carry over period
- Starch level did not affect DMI

Conclusions: Postfresh Starch

- Why contradictory results?
  - Dependent on prefresh starch?
  - Dependent on level/fermentability of starch?
  - Dependent on other carbohydrate sources?
  - Dependent on NDF and it's digestibility?
- More research to define optimal levels

Conclusions

- In most situations, cows do not need to be fed a separate close-up diet for the purpose of increasing concentrate (starch) intake.
- Feeding controlled energy diets reduces fat mobilization, blood NEFA and BHBA, and liver TG.
- When feeding controlled energy diets, milk fat percentage is likely to be reduced and in a few trials milk yield has also been reduced.
- Optimum energy density for single dry cow diets has not been defined.
- Fresh cows *should* be able to be fed diets containing 25-26% starch immediately after calving. But further research is needed to determine how factors such as prefresh diet, starch fermentability, fiber digestibility, etc. may influence the optimum starch content of fresh cow diets.
- Formulating transition cow diets is part SCIENCE and part ART

Virginia State Feed Association Cow College February 2017

Mycotoxin Management in Beef and Dairy Cattle

Randy Asher

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What We Will Cover

- Do we have a mycotoxin problem?
- Can our herd problems be something else?
- Conditions that magnify a mycotoxin problem
- Determining the source of a mycotoxin problem
- Treating the problem to maintain production and reproduction efficiencies
- Managing and preventing future mycotoxin problems

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Know what you are actually dealing with. TROUBLESHOOT

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Our Major Challenge

- Are the symptoms related to mycotoxins, or are they the result of another existing condition?
- Am I seeing a mycotoxin-related problem in conjunction with another existing condition?
- Do I have a problem that I am blaming on mycotoxins, yet mycotoxins are not involved.

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Some Common Symptoms

- Milk production drop
- Lethargic, dull rough appearance
- Increased incidence of mastitis and metritis.
- Variety of reproduction problems
- Stool variability, loose, diarrhea
- Lower than normal dry matter intakes
- Immuno-suppression (disease incidence up)

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Adverse Effects of Mycotoxins

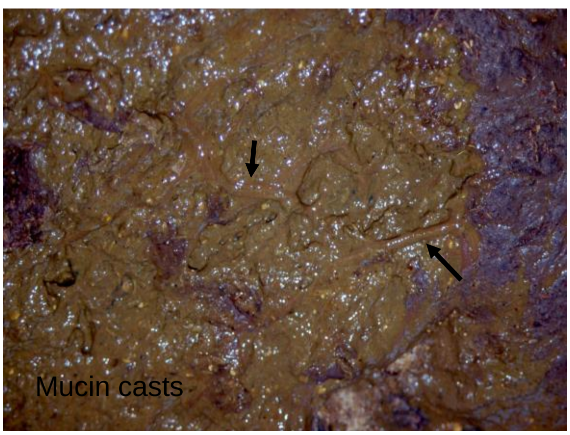
- Immunosuppression
- Increased susceptibility to diseases
- Damage to organs
- Poor reproductive performance
- Decreased feed intake, production

FRESH COWS HAVE A COMPROMISED IMMUNE SYSTEM

- Neutrophil Capacity at 50%
- Blood Serum vitamin E levels drop 47%
- Retinol levels drop 38%
- Zinc levels decrease by 67%
- Cu stores to the calf @ cow's expense
  - From birth to 56 days of age Cu stores in liver decreased 74% (Branum 1999)

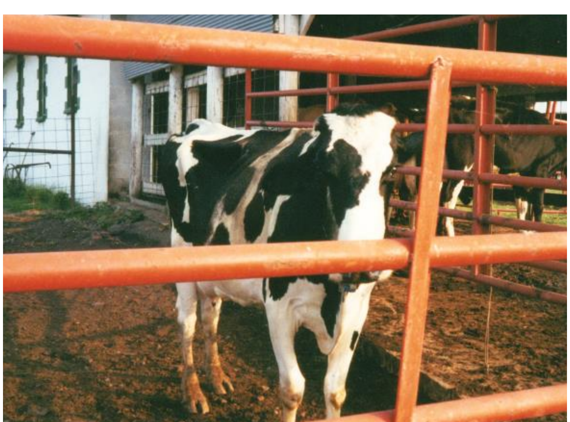
Examples

- Troubleshooting means doing the detective work in an effort to problem solve
- Rule out causes of problem one at a time
- Consider multiple number of causes contributing to the problem
- If mycotoxins are involved, we may have to fix problems other than mycotoxins to see maximum results.



When you see this ?

- Acidosis – nutritional or feed management related?
- Winter Dysentary ? Rota, Corona, E. Coli, Salmonella ?
- Mycotoxins ? (T-2, DON, T-2 + DON, some AF)



Dull, Lethargic, Unthrifty

- Is it management?
- Is it nutritional?
- Is there a specific disease involved?
- Are the animals in herd subjected to stray voltage?
- Do we have a mycotoxin problem?
- If it is mycotoxins..acute or chronic ?

Fescue Toxicosis

- Toxins produced by *Acronemium coenophialum* have been associated with several adverse effects
  - ↓ feed intake
  - ↓ weight gain
  - ↓ milk production
  - ↓ reproductive performa
  - ↑ internal body temperat
  - ↑ respiration rates
  - ↑ rough hair coat
  - ↑ salivation

Second and Third Trimester Abortions

- Is there a disease challenge involved?
- Is it a mycotic abortion? (aspergillus, mucor)
- Are we dealing with a mycotoxin issue?

HBS

- Do we have a challenge from clostridium perfringens type A ? (i.e., haylage poorly fermented, high ash and butyric acid)
- Forage testing a must now.
- Is there a chance we have T-2 toxin altering digestive tract integrity.

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Low Feed Intakes

16 Contributing Factors

- Too much grain
- Not enough forage
- Poorly fermented silages
- High NPN or soluble protein
- Limited water intakes
- Dirty feedbunks
- Finely chopped forages
- Reduction in chewing, rumenation
- Ration imbalanced
- Minerals out of balance
- Inadequate feedbunk space
- Over-conditioned cows
- Not enough being fed
- High butyric acid levels
- Moldy feedstuffs
- Mycotoxins

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Low Milk Production

13 Possible Reasons

- Not peaking properly
- Low persistency
- High incidence of mastitis
- Fresh cows lack energy in diet
- Over-conditioned cows
- Nutrient deficiencies and/or imbalances (protein & energy)

You can think of a few more

- Feed delivery (frequency and consistency)
- Low dmi's
- Days in milk?
- High somatic cell counts
- Disease challenge
- Stray voltage
- Mycotoxins

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Conditions that Magnify a Mycotoxin Problem

- Stress (environmental, overcrowding, comfort)
- Disease Challenge
- Diet
- Stray Voltage

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Determine the Possible Sources of a Mycotoxin Problem

- Fermented Feedstuffs (silage, haylage, baleage, high moisture corn, grasslage)
- Purchased commodities
- Purchased forages
- Purchased feed ingredients
- Stored commodities on farm

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Crop Stress

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Field Checks

Treating the Mycotoxin Problem

- Utilize a mycotoxin adsorbent
- Address problems encountered such as immune system suppression
- Address problems such as poor reproductive performance
- Has digestive tract integrity been compromised?

Managing a Mycotoxin Menace Through Nutrition

- May need to utilize organic trace elements to improve the status of the immune system, reproductive performance, hair and hoof health (30-40% of tm's in organic form)
- Increased vitamin A levels
- Increased vitamin E levels
- May need additional protein and energy in the diet

Managing the Mycotoxin Menace With Feed Additives

- Buffers – maintain protozoal numbers and rumen pH
- Mold Inhibitors - in tmr to reduce possible further mold growth
- May use mold inhibitors on face and top of bunkers to prevent mold growth and subsequent mycotoxin formation
- Digestive enzyme additives – aid in digestion (mycos may have altered beneficial microflora)
- Microbial feed additives – to help aid in rumen and digestive tract function
- Utilize mycotoxin adsorbent

Manage Factors that Magnify Problem

- Stress – reduce stress at every opportunity
- Do not overcrowd cows
- Manage environmental factors – bedding, air quality, water quality, noise, cow flow, etc.

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Manage Factors that Magnify Problem (cont…)

- Disease Challenges
- Diet (properly balanced diet)
- Stray Voltage

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Preventing (managing) Future Mycotoxin Problems

- Pre-harvest
- Harvest
- Post-harvest
- Storage
- Feedout

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Pre-harvest Control Strategies

- Soil Prep (are we in no tillage? crop rotation?
- Plant variety selection – Mold resistant? Adapted to geographical area.
- Plant variety selection – insect resistant?
- Herbicide application timing

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Harvest Control Strategies

- Harvest timely – delayed harvest may increase contamination
- Early harvest of AF contaminated grain may prevent further contamination
- Harvest at proper moisture levels when possible

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Harvest Control Strategies (cont..)

- Proper combine adjustment – prevents excessive kernel damage
- Excessive kernel damage=predisposition to further infection during storage
- For corn silage, maintain proper TLC

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Storage (grains)

- Dry grains before storing if needed
- Clean storage bins prior to storage
- Clean auger pits prior to usage

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Storage of Fermented Feeds

- Upright silos – clean and airtight
- Bunker silos and piles – fill, pack and cover rapidly. Make sure pack is adequate.
- Cover - completely, cover tight

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Side, top, and exposed face of a bunker spoils

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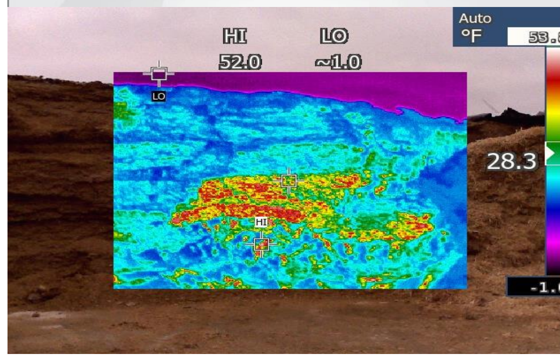
Feedout – fermented feedstuffs

- Remove adequate amount off of face
- Pull back only needed amount of plastic
- Remove from face in manner to minimize face disruption
- Keep face as smooth as possible
- Monitor face for hotspots

IR Camera



Use All Available Tools and Resources

- Infra-red camera
- Lab reports
- Bunker Densities
- Temperature Probes

Using Lab Reports to Identify Problems

Use Lab Reports To:

- Diagnose Production Problems Associated with Poor Quality Feedstuffs
- Determine Possible Causes of Reproduction Problems
- Identify Possible Causes of Health Problems

Lab Reports

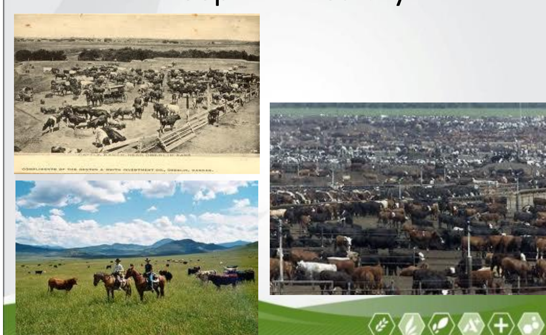
- Mold and Yeast Counts
- Mold Identification
- Mycotoxin Screen
- Fermentation Profile
- Nitrate Tests
- Nutrient Analysis

TESTING

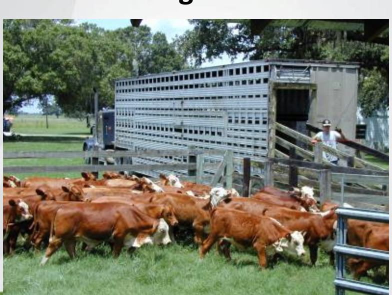
- HPLC – favored for sensitive reliable results
- ELISA – Antibodies may cross react. Antibody can be mistaken for toxin presence
- Blacklight – may get false positives or negatives

Know what you have to deal with and keep them on track

Keep 'Em Healthy



The Big Picture!



Mold and Mycotoxin Info

- www.knowmycotoxins.com
- Cast Manual
- Mycotoxin Bluebook


Thank You
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