



Nutritional Impacts on Calf Health; Myths & Truths

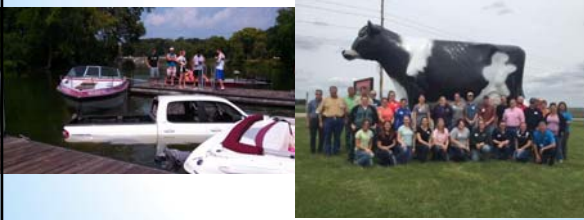
Tom Earleywine Ph.D.
Director of Nutritional Services



Our objective: **Do what's right for the calf** by continuing to lead the industry towards improving the health, performance and profitability of raising calves and heifers.



Myth: Nobody likes to work with Calves!



Land O'Lakes Animal Milk Products Current Calf Milk Replacer Research Effort

- Moderate Health
 - 24 Trials per Year
 - 6 Groups
 - 1512 Calves
- High Health
 - 3-5 Trials per Year
 - 280 Calves
 - Heifers & Bulls




Research Partnerships



Improving Calf Health

- Reduce Failure of Passive Transfer (FPT): Gram negative sepsis
- Myth: Fixing this will stop all calf health issues.
- Why Not?

Improving Calf Health

- Higher plane of nutrition at right temp. 120° - 130°F mixing
100° - 105°F for feeding
 - Consistent milk/milk replacer
- Basic nutrient calculations
 - Amount of fat vs. energy & DM
 - 2qt 3X vs. 3qt 3X
 - 1.5 2.5 DM
 - 25 10 Fat %
 - 0.375 0.25 Fat lb.
 - 3.53 5.18 Mcal Energy

Why the “published” equation to convert brix% to solids in milk is WRONG!

- Moore added water to 4 samples to get a range
- Brix does not pick up fat well – brix is intended for solids DISSOLVED in water!!
- Each milk replacer will have a unique conversion dependent upon fat level & level of fat encapsulation.

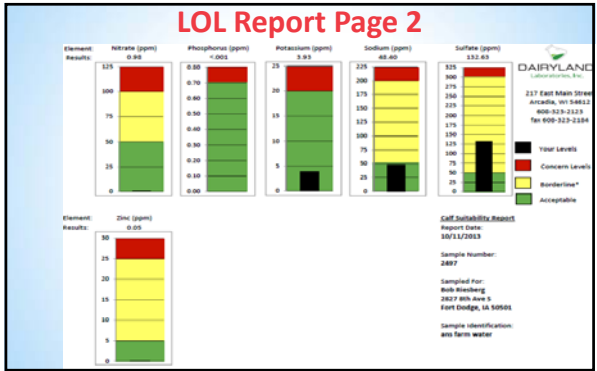
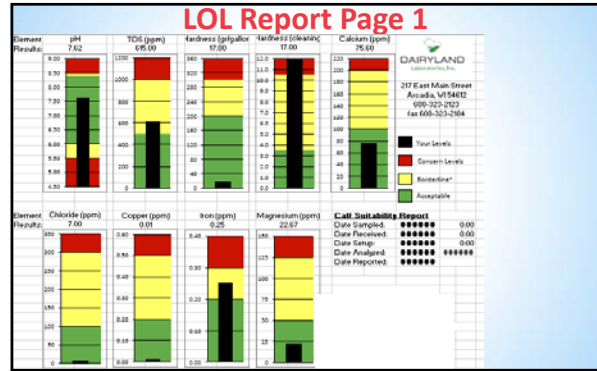
Improving Calf Health

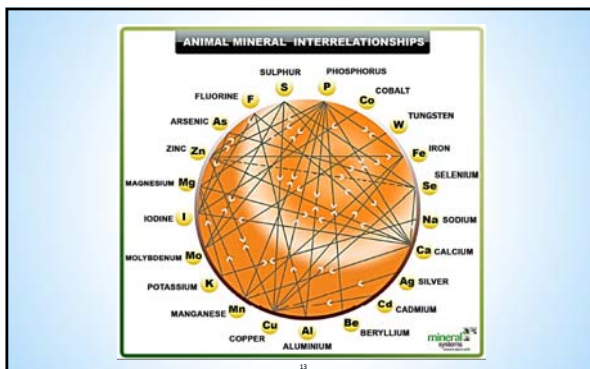
- High quality water
 - Free Choice & mixing
 - Electrolytes
 - Cleaning water



217 E. Main St., Arcadia, WI 54612 • Phone (608) 323-2123 • FAX (608) 323-2184 • Email: info@dairylandlabs.com

Ask for the LOL Calf Suitability Test!!!





Bacterial Analysis of Water – Do it!!

- Every bit as important as minerals
- More contamination than we realize
- Varies by time of year

Improving Calf Health

- Proper Cleaning & Sanitation
 - Anything that touches calf – especially hands & feet of people
 - Chlorine dioxide – breaks down biofilms & kills crypto
- Dry (Great Drainage), Well Ventilated Calf Housing
 - More & Better options for people & calf today





What is a Higher Plane of Nutrition?

- Is this enough?

| | |
|------------------------------------|------------|
| 100 lb. Bodyweight | |
| Dry Matter | 1.5 |
| Qts./fdg (2X) | 3.0 |
| Qts./fdg (3X) | 2.0 |
| Qts./fdg (2X) at 15% Solids | 2.3 |

Other than Temperature – What Else Impacts Energy & Protein Needs?

- Short of bedding one day
- Out of grain/water for a short time
- Changes in weather
- Scours – even minor cases
- Respiratory disease – even minor cases
- Moderate infections increase energetic needs by **150 to 200%**

Lochner, R. L. and Deerenberg, C. 2000. Trade-offs in evolutionary immunology: just what is the cost of immunity? – Oikos 88: 87–98.

Other than Temperature – What Else Impacts Nutrient Needs?

- Inflammation!
 - Inflamed tissues have much lower content of nutrients like vitamin E (36% of controls), which indicates a much greater requirement during inflammatory challenges.
 - Direct use of nutrients by inflammatory cells and the liver
 - Higher metabolic rate
 - Decreased feed intake and associated energy losses
 - Less efficient digestion

Rate of Gain at Different Stress (scours, draft, poor bedding, etc.) Levels

| Assumptions | | Rate Of Gain | | |
|------------------------------------|------------|----------------------------|---------------------------|-----------------------|
| Temperature °F | 32 | No Add'l Stress | Low level of Added Stress | Moderate Added Stress |
| 100 lb. Bodyweight | | | | |
| Dry Matter | 1.5 | | | |
| Qts./day | 6.0 | Maintenance Needs Increase | 0% | 25% |
| Qts./fdg (2X) | 3.0 | Daily Gain Lb. | 0.68 | 0.14 |
| Qts./fdg (3X) | 2.0 | | | Wt. Loss |
| Qts./fdg (2X) at 15% Solids | 2.3 | | | |

And this is with what appears to be a "good" plane of nutrition!

Rate of Gain at Different Stress (HEAT, scours, draft, poor bedding, etc.) Levels.

| Assumptions | | Rate Of Gain | | |
|------------------------------------|------------|----------------------------|------------------|-----------------------|
| Temperature °F | >75 | No Add'l Stress | Low Added Stress | Moderate Added Stress |
| 100 lb. Bodyweight | | | | |
| Dry Matter | 1.5 | | | |
| Qts./day | 6.0 | | | |
| Qts./fdg (2X) | 3.0 | Maintenance Needs Increase | 0% | 75% |
| Qts./fdg (3X) | 2.0 | Daily Gain Lb. | 1.31 | 0.34 |
| Qts./fdg (2X) at 15% Solids | 2.3 | | | Weight Loss!! |

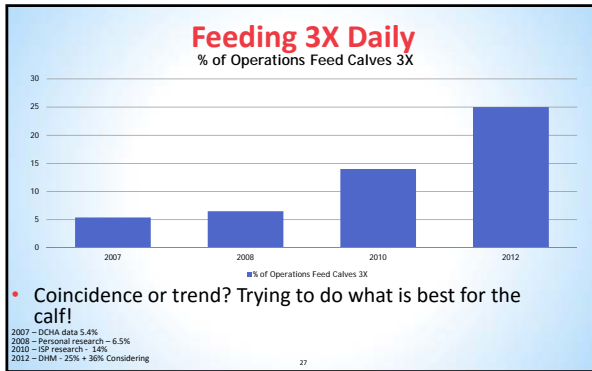
And this is with what appears to be a "good" plane of nutrition!!!

Myth: Most people feed 2 quarts 2X

NAHMS 2014
Daily Dry Matter Fed from Milk or Milk Replacer

| Herd Size (number of cows) | Very small (fewer than 30) | | Small (30-99) | | Medium (100-499) | | Large (500 or more) | | All Operations | |
|---|----------------------------|---------------|---------------|----------------|------------------|----------------|---------------------|---------------|----------------|----------------|
| | Pct. | Weighted (qt) | Pct. | Weighted (qt) | Pct. | Weighted (qt) | Pct. | Weighted (qt) | Pct. | Weighted (qt) |
| Daily | | | | | | | | | | |
| Less than 4 | 5% | 0.2025 | 3% | 0.09375 | 3% | 0.10875 | 4% | 0.1425 | 3% | 0.11625 |
| 4-5 | 56% | 2.5065 | 55% | 2.4705 | 54% | 2.4255 | 35% | 1.5615 | 53% | 2.3985 |
| 6-7 | 17% | 1.131 | 22% | 1.425 | 21% | 1.391 | 25% | 1.5925 | 21% | 1.3845 |
| 8-9 | 13% | 1.1135 | 16% | 1.3175 | 16% | 1.36 | 28% | 2.346 | 16% | 1.377 |
| 10 or more | 8% | 0.84 | 5% | 0.52 | 6% | 0.58 | 9% | 0.94 | 6% | 0.61 |
| Total | 100% | 5.7935 | 100% | 5.82525 | 100% | 5.86525 | 100% | 6.5825 | 100% | 5.88625 |
| Daily Dry Matter Avg. (12.5% solids @ 1.075 lb./gallon) | | 1.56 | 1.57 | 1.58 | 1.77 | 1.58 | | | | |

- ### Myth: Fat is the Answer.
- Typically added fats are 7% protein and 60% fat
 - Dietary imbalance!
 - Quickly become short of protein
 - Shorter, fatter calves – poorer feed efficiency
 - Fat adds to total solids, causes mixing and cleaning problems
 - Fat is not quickly nor efficiently utilized by the calf!
 - Fat above 20% of diet dry matter hinders starter intake
 - Best option is to feed more milk/milk replacer!



Consider an Automated Calf Feeding System?



- An efficient tool for delivering a higher plane of nutrition
- Land O'Lakes has 9 years of research on the feeders (>2100 calves)



- ### Summary
- Autofeeder/Group Housing add flexibility in:
 - Labor
 - Feeding levels
 - Weaning programs
 - They have challenges:
 - Biosecurity
 - Scours detection
 - Ventilation/Overcrowding/Pneumonia

Body Condition

Evaluate energy reserves "fat storage".

Good

Body Condition

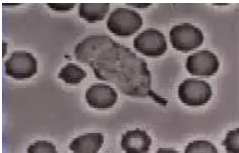
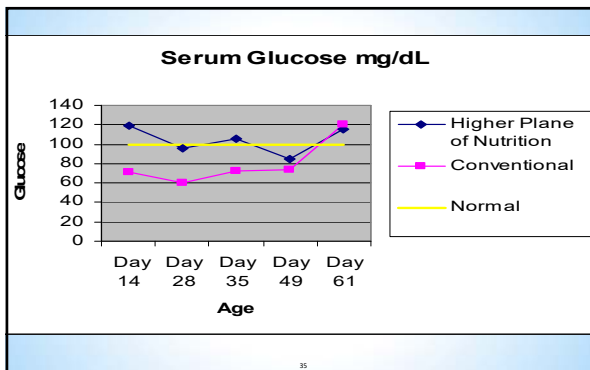



Poor

**Ever heard someone say
"Look at my skinny baby!"**

Fowler 2004

Phagocytosis

Myth: Poor Prewearing Nutrition can be fixed postweaning

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- Better feed efficiency pre & post weaning w/higher plane of nutrition preweaning.
- Morbidity was 22.2% vs. 45.5% for the high vs. low plane of nutrition calves that were salmonella challenged.

Ballou et al. JDS 98:1972-1982 2015

Starter Intake Pre & Post Challenge

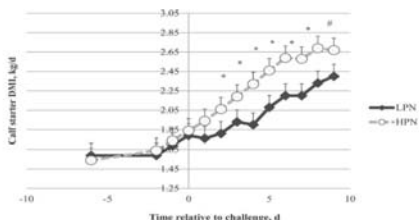


Figure 2. Effects of plane of nutrition in experiment 2. LPN = low plane of nutrition, n = 11; HPN = high plane of nutrition, n = 11 on calf starter DMI from -6 to 9 d relative to an oral challenge with 1.5 x 10¹⁰ cfu of *Salmonella enteritidis* serotype Typhimurium. ATCC# 49189 on d 0 after initiation of treatments. No treatment x time effect was observed (P = 0.321), but treatment (P = 0.009) and time (P = 0.003) effects were seen, and their effects were detected by an asterisk (*P < 0.05, #P < 0.10). Error bars represent SEM.

Challenged w/Salmonella ~28 days postweaning (80 days old). All calves were fed the same diet postweaning

Myth: Nothing can be done about crypto in calves.

The Effect of Nutritional Plane on Health and Performance of Dairy Calves after Experimental Infection with *Cryptosporidium parvum*

TL Ollivett, DV Nydam, TC Linden, DD Bowman, M. Van Amburgh



Ollivett JAVMA_2012_Vol 241, No. 11 1514-1520

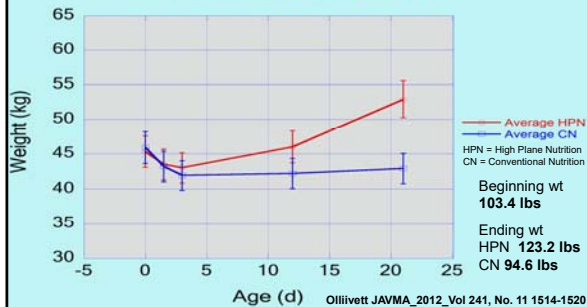
Results

| | Conventional plane of nutrition | High plane of nutrition |
|--------------------------------|----------------------------------|---|
| Hydration (packed cell volume) | 40% (dehydrated) | 32% (not dehydrated) |
| Fecal score improvement | Median = 0.01 FS improvement/day | Median = 0.1 FS improvement/day Improved 10X as fast |
| Average daily weight gain | -48 g/day (-0.11 lb/day) | 433 g/day (0.95 lb/day) |
| Feed efficiency | -31.4 g/kg | 131.9 g/kg |



Ollivett JAVMA_2012_Vol 241, No. 11 1514-1520

Crypto Challenge Added Feeding Number 5 Average Calf Weight by Age



Beginning wt 103.4 lbs
Ending wt HPN 123.2 lbs
CN 94.6 lbs

Myth: The impact of preweaning nutrition has been overrated!


Milk Yield response following greater pre-weaning milk or milk replacer nutrient supply.

| Study | Increase of Milk Yield*, lbs | P-value |
|-----------------------------------|------------------------------|---------|
| Foldager and Krohn, 1994 | 3097 | <0.05 |
| Bar-Peled et al., 1997 | 999 | <0.10 |
| Foldager et al., 1997 | 1144 | <0.10 |
| Ballard et al., 2005 (at 200 DIM) | 1543 | <0.05 |
| Shamay et al., 2005 | 2163 | <0.05 |
| Drackley et al., 2007 | 1845 | <0.05 |
| Raeth-Knight et al., 2009 | 1583 | ns |
| Terré et al., 2009 | 1376 | ns |
| Morrison et al., 2009 | 0 | ns |
| Moallem et al., 2010 | 1614 | <0.05 |
| Davis-Rincker et al., 2011 | 917 | ns |
| Soberon et al., 2012 | 1217 | <0.05 |

*Difference between treatment and control milk yield.
Soberon & Van Amburgh, 2013 JAS 91:706-712

Economic Comparison of Conventional vs. Intensive Heifer Rearing Systems

- Michael Overton, DVM, MPVM



Denise Rich - therichartist.com




Summary of Results

Based on the current assumptions used in this model:

| | | Advantage |
|-------------------------------|-------------|------------------|
| Feed costs | (\$61) | Conventional |
| Labor costs | \$29 | Intensive |
| Health/ vet med | \$11 | Intensive |
| Interest cost | \$10 | Intensive |
| Reproductive culs | \$10 | Intensive |
| Other costs | \$33 | Intensive |
| Lost investment (dead calves) | \$12 | Intensive |
| Calf investment cost | \$4 | Intensive |
| Net Result - Savings: | \$47 | Intensive |

- Add in value of additional milk in 1st lactation of \$152 and the average advantage for **Intensive Rearing ~ \$199**

Michael Overton, DVM, MPVM 2013

That's All Fine But...

- How do I get it done ... economically?
- Myth: Milk replacer must be all-milk to grow healthy calves.
 - Past it was true
 - Today there are very viable well researched options that contain a blend of proteins including milk & soy.


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The Effects of Supplementing Two Pasteurized Milk Balancer Products to Pasteurized Whole Milk on the Health and Growth of Dairy Calves

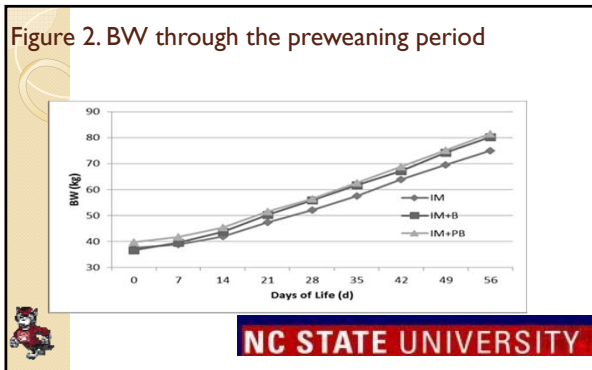
2015 JDS 98 | 1127-1135

K. Glosson¹, B. Hopkins¹, S. Washburn¹, S. Davidson¹, G. Smith¹, T. Earleywine², and C. Ma¹


¹North Carolina State University, Raleigh
²Land O'Lakes Animal Milk Products, St. Paul, MN.



NC STATE UNIVERSITY



“Calves receiving supplemental **milk balancer products resulted in greater growth rates** with similar overall calf health. The similarity of calves receiving either of the two supplemental balancers in all growth measurements analyzed, combined with similar health data, indicates that there were **no adverse effects when using the more economical protein blend balancer** alternative over the all-milk balancer product.”



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Summary

- Necessary for optimum calf performance;
 - Proper Colostrum
 - Plane of Nutrition
 - Consistent whether milk or milk replacer
 - Balancer type products can help you get there w/milk
 - Water Quality
 - Cleaning & Sanitation
 - Housing/Ventilation


Myth: The new drug regulations will make it tough to keep calves healthy.

- Truth: Through proper nutrition & management calves can be healthier than ever!


Summary

- Calves need 2+ gallons of milk/milk replacer daily in 2 to 3 feedings to survive and thrive

3X or 2X



Do what's right for the calf by continuing to lead the industry towards improving the health, performance and profitability of raising calves and heifers.



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Questions?



Thank You!

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