2017 MDC
MIDWEST DAIRY CONFERENCE

Feeding and Managing for Transition Success

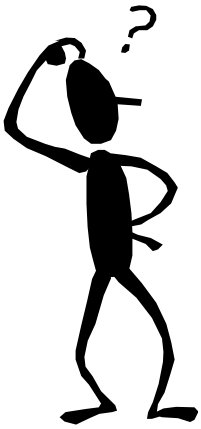
Dr. Heather Dann
Research Scientist
W. H. Miner Institute, Chazy, NY

Nutrition and Management During the Dry and Fresh Periods Dictate the Success or Failure of the Lactation

Transition Success

- The cow is…
  - Healthy
  - Produces a large quantity of milk with good components
  - Able to reproduce at the appropriate time
- The dairy is…
  - Profitable and sustainable

2017 MDC
MIDWEST DAIRY CONFERENCE



What are our challenges?

Stressors

Are There Nutritional, Environmental, or Social Stressors?

2017 MDC
MIDWEST DAIRY CONFERENCE

Potential Stressors for Transition Cows

- **Nutritional**
  - Quality and availability
  - Metabolic adaptations…disease/disorders
- **Environmental**
  - Uncomfortable housing (stall, floor, ventilation)
  - Cold or heat stress
- **Social**
  - Overcrowding
  - Sub-optimal grouping and movement
  - Maternity pen management
- **Infectious**
  - Infectious challenge

2017 MDC
MIDWEST DAIRY CONFERENCE

2017 MDC
MIDWEST DAIRY CONFERENCE

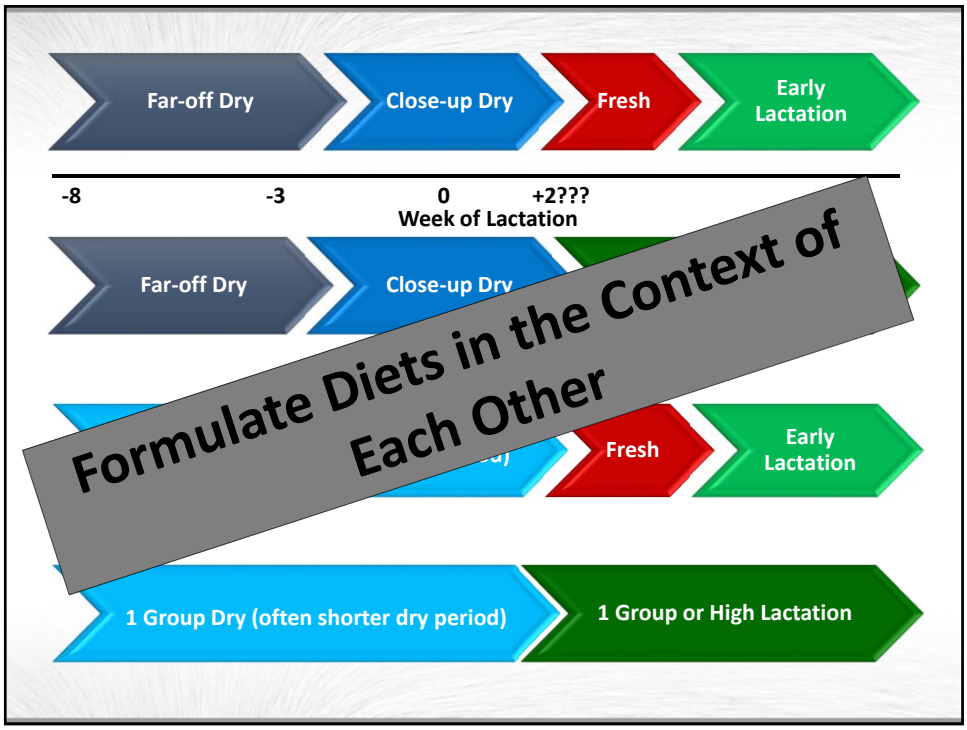
- ✔ Energy balance & subclinical ketosis
- ✔ Subacute ruminal acidosis (SARA)
- ✔ Subclinical hypocalcemia (milk fever)

2017 MDC
MIDWEST DAIRY CONFERENCE

Dry and Fresh Cow Nutrition Continues to Evolve

- **Use integrated strategies to support…**
  - **Energy metabolism**
  - **Protein metabolism**
  - **Mineral metabolism**
  - **Immune function**
  - **Rumen function**

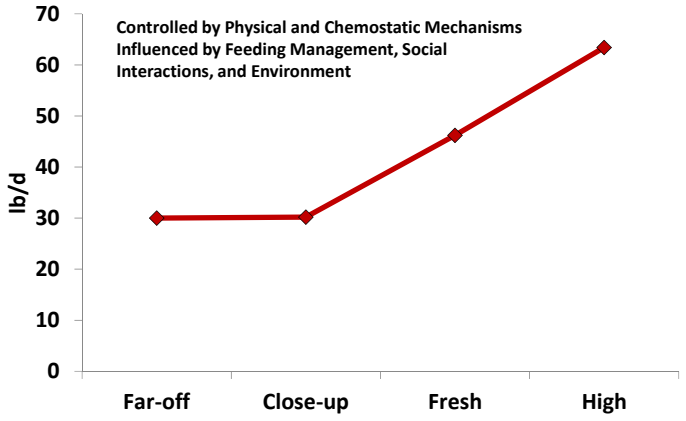
- Different approaches dictated by…
  - Management philosophy and ability
  - Feed availability and quality
  - Facilities and grouping



How much TMR are the cows eating?

2017 MDC
MIDWEST DAIRY CONFERENCE

Intake is Critical for Success



2017 MDC
MIDWEST DAIRY CONFERENCE

Fresh Period Health Problems Related to Dry Period Intake on 2 Dairies with ~1500 to 1600 lb Holsteins

Too little intake…

- ~26 to 28 lb/d
- Action
  - Test feed quality/digestibility
  - Evaluate bunk management, feed availability
  - Assess non-nutritional stressors

Too much intake…

- >33 lb/d
- Before calving
  - BW/BCS gain
- After calving
  - Sluggish intake
  - Excessive BW/BCS loss
- Action
  - Limit grain-type forages, other palatable feeds to control intake
  - Complement with a consistent, low K, bulky forage source

2017 MDC
MIDWEST DAIRY CONFERENCE

Carbohydrates

A Focus Area Since Carbohydrates Contribute the Majority of Energy

- Steam-up vs high forage (controlled energy) dry diets
  - 0.56 to 0.66 Mcal NEL/lb DM
    - (1.25 to 1.45 Mcal NEL/kg DM)
  - 100 to 110% ME
- Prolonged overconsumption of energy during the dry period can result in poorer transitions

Overfed Cows Have…

- Abdominal fat deposition
- Insulin resistance
- Blood NEFA and BHBA
- Liver triglyceride
- Body weight/condition loss after calving
- Health problems

- Intake
- Milk
- Reproductive performance
- Profitability

Common Way Cows Consume Too Much Energy on a Properly Formulated Diet

Hay & Straw Not Incorporated Well, Particle Size Too Long

Photos Courtesy of T. R. Overton

2017 MDC
MIDWEST DAIRY CONFERENCE

3/4”		20%
5/16”		40%
5/32”		20%
Pan		20%

2017 MDC
MIDWEST DAIRY CONFERENCE

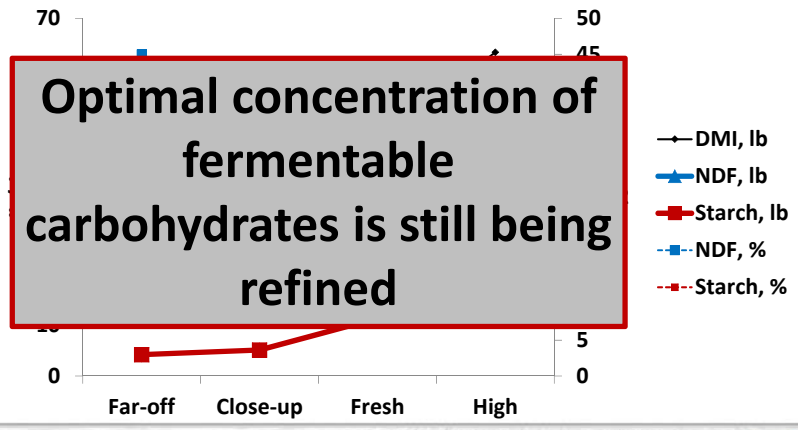
Fresh Cow Diet Frequently Based on the High Cow Diet

- **Some common adjustments…**
  - **Less starch & more fiber**
  - **More physically effective fiber (peNDF)**
    - **Usually less than 2.2 lb of chopped straw/hay**
  - **Additional rumen undegradable protein/AA**
  - **Additional rumen inert fat**
  - **Strategic addition of other nutrients and additives**
    - **Monensin, yeast products, & RP-choline**

- **Promote rumen function and a rapid rise in intake**

2017 MDC
MIDWEST DAIRY CONFERENCE

A Smooth Carbohydrate Change Promotes DMI and Decrease Risk of SARA and Associated Inflammation



Optimal concentration of fermentable carbohydrates is still being refined

Fine Tune the Carbohydrates Based on the Dry and Early Lactation Diets

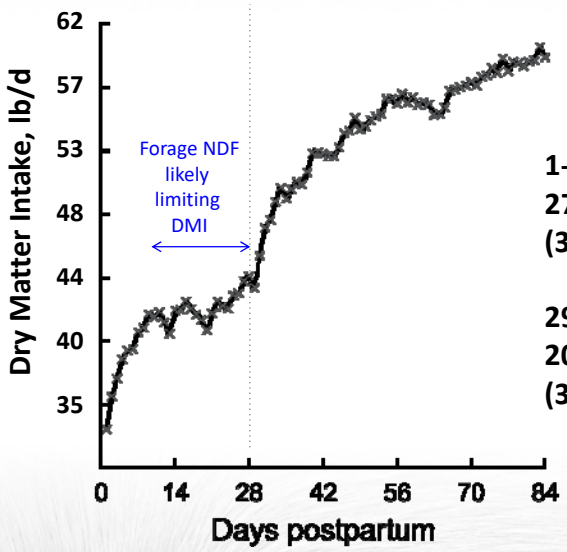
- Use a lower starch (18 to 23%) fresh diet when cows are fed a controlled-energy, high-forage (≤16% starch) dry diet
- Use of a higher starch (23 to 26%) lactation diet is ok when cows are fed a moderate-energy (17 to 20% starch) close-up diet and the fresh diet has appropriate peNDF (≥ 21%)
- 28-36% NDF, 4-8% sugar
- Consider total fermentable carbohydrate; measure digestibility of starch & NDF

2017 MDC
MIDWEST DAIRY CONFERENCE

How Long Do or Should Cows Remain in the Fresh Pen?

- **10 to 42 DIM with 14 to 21 DIM the most common**
- **The optimal duration of stay in a fresh pen is unknown…it most likely varies among farms and cows**

Don't Leave Cows on the Fresh Diet for Too Long



1-28 d postpartum
27% forage NDF
(31% NDF, 26% starch)

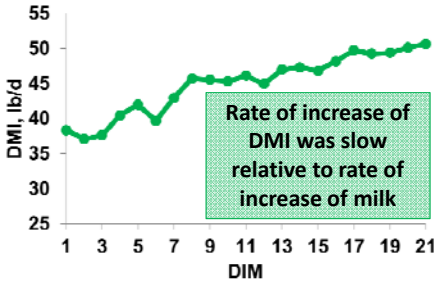
29-84 d postpartum
20% forage NDF
(32% NDF, 28% starch)

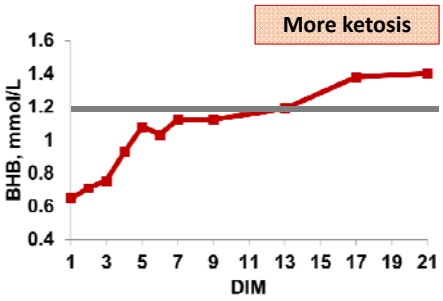
Data Courtesy of M. Allen

2017 MDC
MIDWEST DAIRY CONFERENCE

Check Ketones

Intake Limited by Gut Fill/Forage Digestibility Resulted in Increased BHB





2017 MDC
MIDWEST DAIRY CONFERENCE

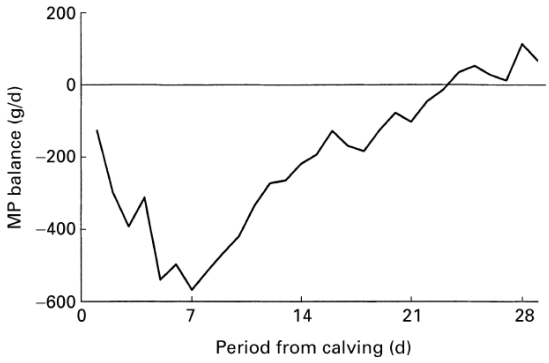
Fats are More than Just Energy

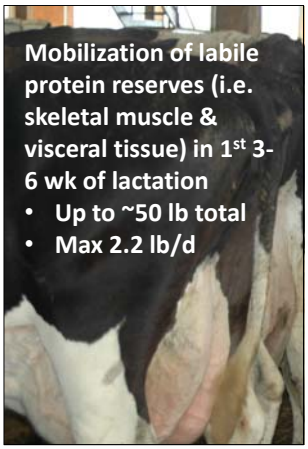
- **Dietary fat is typically 2-3% in dry diet and 4-6% in fresh diet**
- **Supplementing fat and changing fatty acid content (PUFA; CLA) of fat source positively affects reproductive performance** (de Veth et al., 2009; Rodney et al., 2015)
- **Fatty acids can modify immune function** (Bradford et al., 2015; Sordillo, 2016)
- **Fatty acids can affect milk composition**

2017 MDC
MIDWEST DAIRY CONFERENCE

Supply of Metabolizable Protein and Amino Acids is Opportunity

Fresh Cows Experience Negative <u>Protein</u> Balance





Bell et al., 2000

2017 MDC
MIDWEST DAIRY CONFERENCE

Prevent Protein Mobilization Before Calving By Supplying Sufficient Metabolizable Protein

- **Mobilization of labile protein reserves before calving <u>reduces the amount available after calving</u> and <u>increases risk of ketosis</u>**
- **Dry cows: 12 to 15% CP… 1,000 to 1,300 g/d… 85 to 100 g MP/kg DM**
  - **Thin cows before calving mobilize more protein after calving…need more metabolizable protein?**
  - **High stress environments?**

van der Drift et al., 2012; Pires et al., 2013

2017 MDC
MIDWEST DAIRY CONFERENCE

Metabolizable Protein for Fresh Cows

- **Promote intake**
- **Provide sufficient RDP and appropriate fermentable carbohydrates to optimize ruminal fermentation and microbial protein synthesis**
- **Use high quality RUP to provide digestible amino acids**
  - **Use ruminally protected amino acids (especially for lower CP diets)**

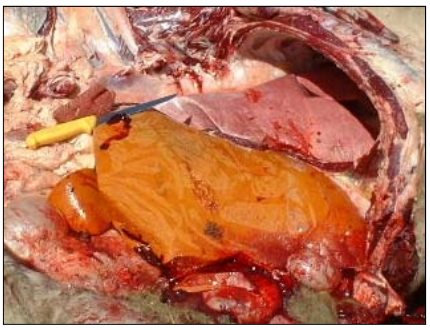
2017 MDC
MIDWEST DAIRY CONFERENCE

Amino Acid Balancing is Beneficial for Transition Cows

- **Lys and Met are assumed to be first limiting; glutamine may be a conditionally essential AA during fresh period**
- **Supplementing Lys, Met, or both starting before calving and continuing into lactation can increase milk yield, milk components, or both and improve immune function** (Wu et al., 1997; Socha et al., 2005; Ordway et al., 2009; Osorio et al., 2013)
- **Responses are dependent on CP, MP supply, and intestinal digestibility of RUP supplements**
- **~75 g Lys/d and ~25 g Met/d for milk protein response**

2017 MDC
MIDWEST DAIRY CONFERENCE

Accumulation of Triglyceride (Fat) in Liver Causes…



- Impaired gluconeogenic capacity
- Impaired ureagenic capacity
- Impaired capacity to clear bacterial endotoxin

2017 MDC
MIDWEST DAIRY CONFERENCE

Choline – a Key Nutrient for Improving Liver Function

- Methyl group donor, component of phosphatidylcholine and acetylcholine, critical for VLDL synthesis
- Rumen protected choline supplemented prepartum and/or postpartum typically
  - Decreased liver fat content
  - Improved performance
- Choline vs. methionine supplementation
  - Both have unique roles

(Piepenbrink and Overton, 2003; Sales et al., 2010; Zom et al., 2011)

2017 MDC
MIDWEST DAIRY CONFERENCE

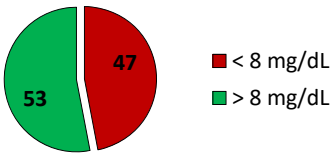
Minerals Play an Essential Role in Many Physiological Processes

- **Hypocalcemia is most reported mineral issue for transition cows**
- **Minerals should be analyzed with wet chemistry vs. NIR**
- **Use a low K close-up or 1 group dry diet that is supplemented with anionic salts or anionic products to decrease DCAD**

Subclinical Hypocalcemia (Milk Fever)
A Bigger Threat Than You May Think

- **Clinical milk fever: 4-7%**
- **Subclinical milk fever**
  - Increases with age
  - Hard to detect …no clinical signs

Subclinical Hypocalcemia, %
1462 cows in 480 herds in 21 states in US



- **Low calcium jeopardizes transition success…**
  - Reduces immunity
    - Higher risk of mastitis and metritis
  - Reduces smooth muscle contractions and GIT motility
    - Lower DMI and higher risk of DA
  - Increases lipid mobilization

Martinez et al., 2012; Oetzel and Miller, 2012; Reinhardt et al., 2011

2017 MDC
MIDWEST DAIRY CONFERENCE

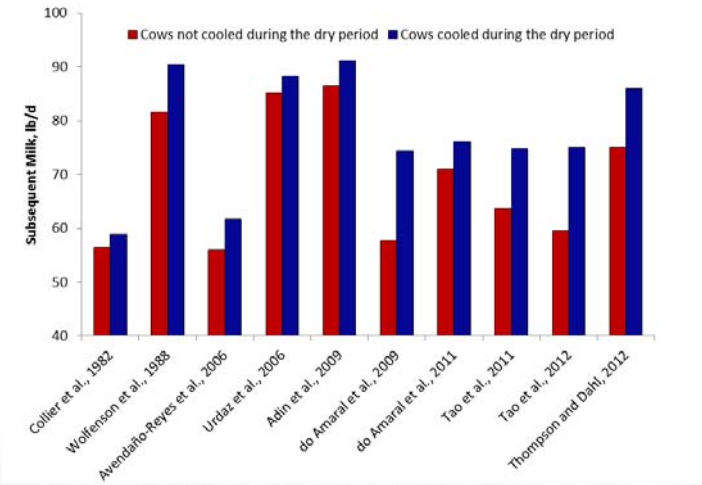
Strategies to Minimize Risk of Hypocalcemia

- **DCAD adjustment for close-up diets**
  - -10 to -15 mEq/100 g
  - Partial supplementation strategy often used but may not fully benefit mature cows
- **Maintain intake before calving and encourage intake after calving**
- **Prophylactic treatment with oral calcium**

Stressors

Are There Nutritional, Environmental, or Social Stressors?

Cooling Cows During the Dry Period Improves Milk Production



2017 MDC
MIDWEST DAIRY CONFERENCE

Cooling Cows During the Dry Period

- **Improves immune function** (do Amaral et al., 2009)
- **Increases colostrum yield and IgG content** (Adin et al., 2009)
- **Increases apparent efficiency of absorption of IgG** (Tao et al., 2012)
- **Increases birth weight and weaning weight of offspring** (Tao et al., 2012)

2017 MDC

J. Dairy Sci. 99:9931–9941
http://dx.doi.org/10.3168/jds.2016-11566

Economic feasibility of cooling dry cows across the United States

F. C. Ferreira,*† R. S. Gennari,* G. E. Dahl,* and A. De Vries*[1]
*Department of Animal Sciences, University of Florida, Gainesville 32611
†EMBRAPA Gado de Leite, Juiz de Fora, MG, Brazil 36038-330

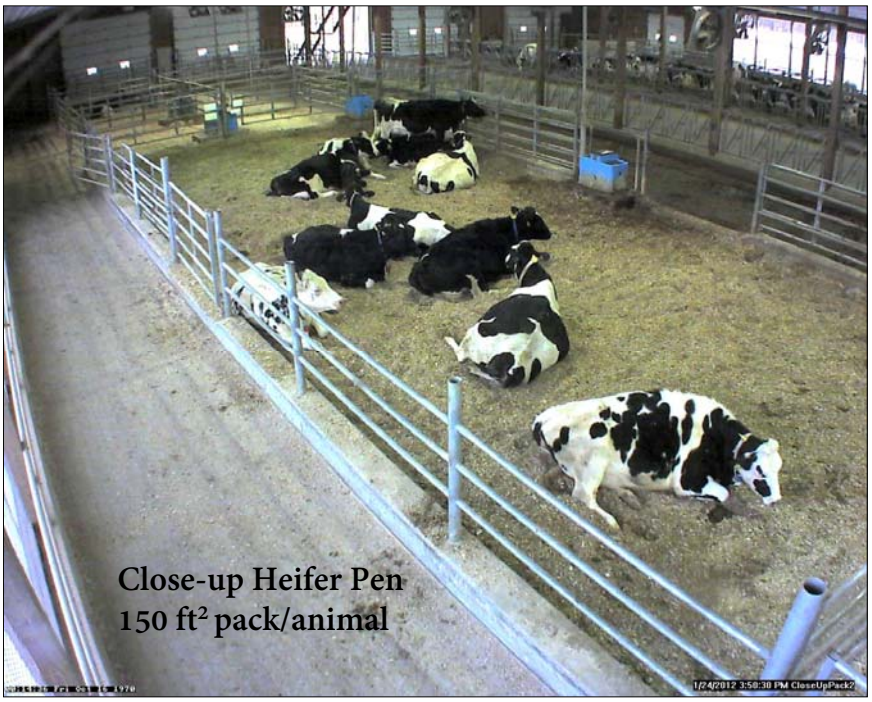
- **Cooling dry cows is affordable**
  - Remodeling an existing barn
  - Building a new barn
- **U.S. default scenario: the benefit to cost ratio and payback period was 3.2 and 0.3 years when a dry cow barn was remodeled to cool cows and 1.5 and 5.7 years if a dry cow barn needed to be built**

The Social "Support" Group

Overcrowding During the Transition Period

- **Overstocking stalls (0.5 vs 1 stall/cow) and feed bunk space (13 vs 26”/cow) increases NEFA and fecal cortisol metabolites in far-off cows** (Huzzey et al., 2011)
- **Headlock stocking density >80-90% or manger space <30”/cow in close-up pen:**
  - **reduces feed intake**
  - **increases DA incidence**
  - **reduces milk yield in first-calf heifers** (Oetzel, 2004)
- **<100 ft^2/cow in close-up pen reduces lying & rumination times, increases incidence of milk fever** (Cook et al., 2004)
- **>100% stocking density of bunks in fresh pen increases eating rate** (Krawczel et al., 2010)

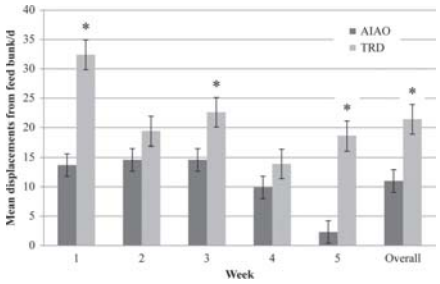
Close-up Cow Pen
110 ft^2 pack/animal



2017 MDC
MIDWEST DAIRY CONFERENCE

Weekly Entrance Close-Up Pen (TRD) vs. All-In-All-Out (AIAO) – Minimal Differences

- **Housing dry cows with stable pen management reduced displacements**
- **No effect on…**
  - **BCS**
  - **Blood NEFA & BHBA**
  - **Milk**
  - **Culling**



Silva et al., 2013; Lobek-Luchterhand et al., 2014

The Calving Pen is an Important Facility Since it Affects the Well-being of the Cow and Newborn Calf

Goals: 1) low stress environment, 2) low health risk for cow and calf, 3) convenience for people, & 4) opportunity for seclusion

Individual maternity pen, bedded pack, or enhanced calving pen

Bedded Pack with Calving Blind vs. Individual Maternity Pen

Item	Pack with Blind	Individual Pen
Calvings, #	30	24
Calvings in blind, #	12	6 (in blind at move)
Blind occupied by other, #	4	4
Calving difficulty	1.6	1.8
Assisted calvings, #	7 (23%)	11 (46%)
Time from 1st lateral contraction to birth, min	98	124
Rumination, min/d (1st 21 DIM)	367	324

Morrison et al., 2013

2017 MDC
MIDWEST DAIRY CONFERENCE

Calving Pen Management Had Effects on the Dam and Newborn Calf

- **Moving and isolating heifers during calving interrupted the process and increased labor duration**

- **Calves had…**
  - **Increased prenatal hypoxia**
  - **Increased indicators of metabolic acidosis**
  - **Delayed 1st attempt to stand**
  - **Reduced appetite at 12 h of birth**

Ji et al., 2013

Commercial Dairy with Calving Blind

"We're finding that cows are enjoying the privacy too, perhaps more than the heifers in our springer group"

Photos Courtesy of Meghan Hauser

Use of blinds to promote calving seclusion and minimize stress associated with overcrowding

2017 MDC
MIDWEST DAIRY CONFERENCE

Time To First Meal After Calving

Does she have access to feed and water?

2017 MDC
MIDWEST DAIRY CONFERENCE

Finding the Wanted Cow

Many approaches can work (and fail) for feeding and managing transition cows!!!

2017 MDC
MIDWEST DAIRY CONFERENCE

Success is more likely when…

- **Minimize nutritional, environmental, and social stressors**
- **Formulate transition diets in the context of one another**

2017 MDC
MIDWEST DAIRY CONFERENCE

- **Maintain intake before calving**
  - **Optimize nutrient intake**
    - **Energy (do not overfeed)**
    - **Metabolizable protein (amino acid) supply**
    - **Minerals (calcium)**
- **Promote a rapid rise in intake after calving**
  - **Minimize duration of negative nutrient balance (energy, metabolizable protein, calcium)**
  - **Optimize rumen fermentation, liver health, and immune function**
  - **Targeted use of feed additives**
- **It takes an integrated approach!**

2017 MDC

dann@whminer.com

www.whminer.org