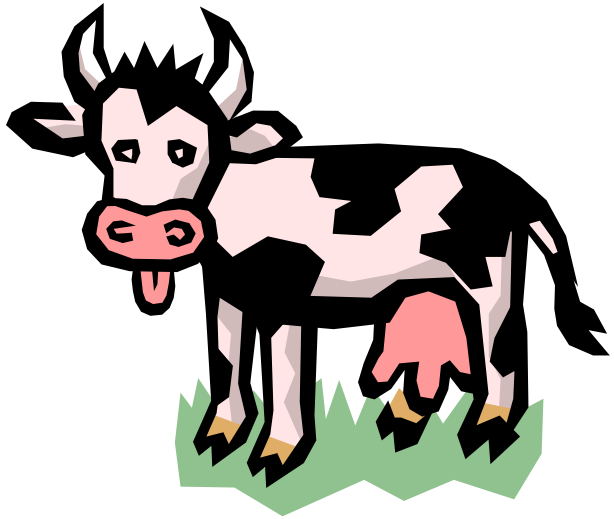
Transition Problems and How to Prevent Them



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Major Goal of Dry and Transition Cow Program

1. Increase milk yields
2. Improve reproduction
3. Improve milk quality
4. Improve calf health
5. Increase profits

The Only Goal of Dry and Transition Cow Program

Keep the cow healthy !

1. Increase milk yields
2. Improve reproduction
3. Improve milk quality
4. Improve calf health
5. Increase profits

Specific Goals of Dry Cow Nutrition Program

1. Prevent ketosis
2. Prevent hypocalcemia
3. Maintain immune system

Estimated costs

- Milk fever: $335/case
- Ketosis: $145/case
- DA: $340/case
- RP: $290/case

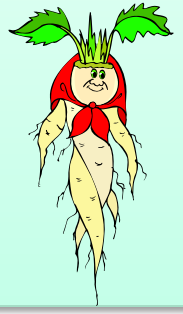
At mean prevalence

$75/cow

Relationships among health problems

- **Milk fever**
  - 5X RR for RP
  - 2.3 X RR for DA
  - 4 X RR for mastitis
- **Ketosis**
  - 13.8X RR for DA (5X for SCK)
  - 1.7 X RR for metritis
  - 3X RR for mastitis

Identify and Fix the **Root** Cause



Subclinical vs. Clinical

Hypocalcemia

-Clinical: Rx, cow is down, cold ears, etc.

-Subclinical: Blood Ca < 8 mg/dL

Ketosis:

-Clinical: Rx, lethargic, off-feed, dehydrated, 'not right,

-Subclinical: BHBA > 1.2 mmol/L

Subclinical is a statistical concept based on probabilities of risk

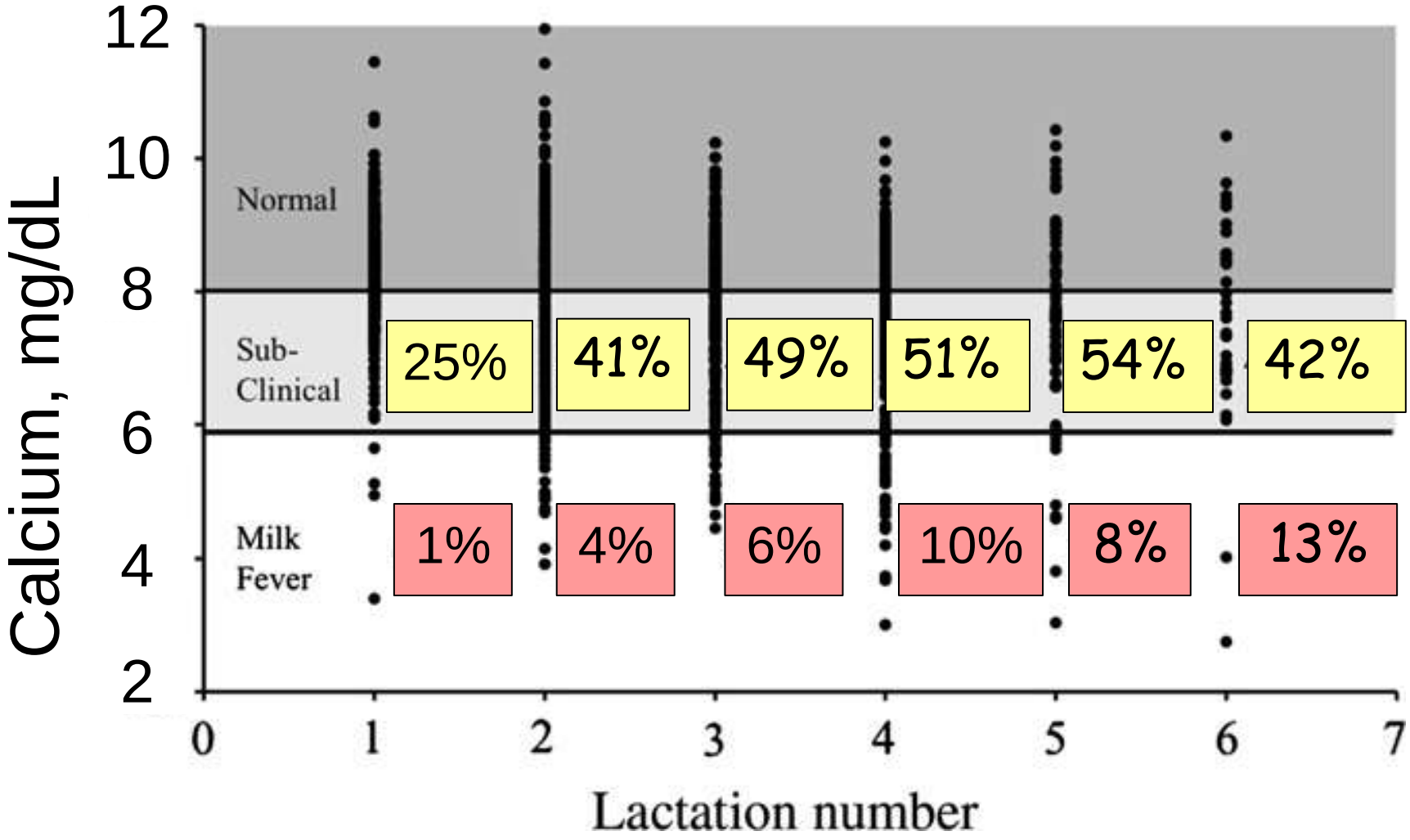
- SC Hypocalcemia = ⇩ PMN function
- SC Hypocalcemia = ⇧ Liver TG, ketosis
- SC Hypocalcemia = ⇧ Metritis, fever
- SC Hypocalcemia = ⇧ RP, DA

Hypocalcemia

Nutritional factors

- Ca
- P
- Mg
- K
- DCAD
- Vitamin D

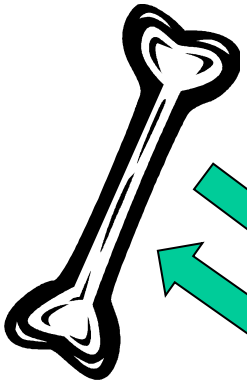
Plasma Ca in 1462 cows within 24 hr after calving (random sample)



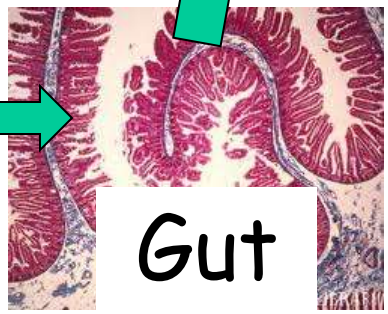
Reinhardt et al., 2011

Calcium Flux

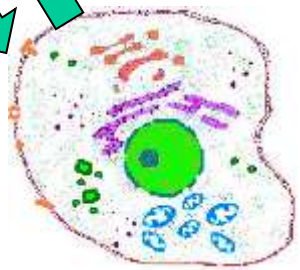
2 DIM:
15-30g/d



Blood (8.0 -10.5 mg/dL)



Gut



Body cells

Preventing Hypocalcemia

1. Maximize ability to absorb Ca by gut
2. Increase Ca resorption from bone
3. Reduce urinary loss of Ca

All require PTH
and production of 1,25 vit D

Vit D 25-OH 1-a-hydroxylase

25-OH vit D ⟶ $1,25\text{-}OH_2$ vit D

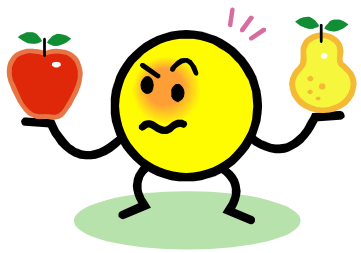
↑Mg (+) ↑P (-)

Strategies to Reduce Hypocalcemia

-Easy: Mg (≥ 0.3%) and vit D (~22 kIU/d)

-Usually easy: P (0.25 to 0.28%)

-Difficult: K (~1%) and Ca (<0.5%)



Option 1:
Easy stuff + Ca as close as possible + K as low as possible + use Mg sulfate

Strategies to Reduce Hypocalcemia

Option 2:

Feed supplemental anions to reduce DCAD

DCAD (mEq) = (Na + K) – (Cl + S)

DCAD ~-20/100 g = ⇩hypocalcemia

- $MgSO_4$, CaCl, NH_4Cl, Soy-chlor, Animate, Bio-chlor, etc.

Very effective

Negative DCAD Diets

1. Monitor urine pH (urine pH: 6.2-6.5)
   - Use to determine correct DCAD
   - Too low = low DMI = ⬆ ketosis
   - Too high = no effect on Ca

2. Keep Mg high (~0.4%) and P at req't

3. Ensure adequate D

4. Ca in excess (~0.8%)

Low DCAD to Reduce Hypocalcemia

Very effective if done correctly

- Must ensure adequate, consistent intake
- Best if only fed 2-3 weeks
- Should not be used with heifers
- Must be monitored (urine pH: 6.2-6.5)
- Expensive but profitable

If not done correctly:
Increased risk of ketosis

Real World Case

Feeding negative DCAD with poor results

-Still had a lot of hypocalcemia

-Urine pH was usually not low enough

Mineral not completely delivered to close up pen (Load is too small)

Slide courtesy Diamond V

Retained fetal membranes (retained placenta)

1. Major cause of metritis
2. Reduces reprod efficiency
3. Greatly increases culling
4. Greatly reduces milk yield

To Reduce Prevalence of RFM

1. Prevent hypocalcemia
2. Feed Se (0.3 ppm)
3. Check water sulfate and iron
4. Feed adequate vitamin E

Vitamin E: 1000 IU/day during dry
2000-5000 IU/d during prefresh

To Reduce Prevalence of RFM

5. Feed adequate vitamin A (90 kIU/d)
   -B-carotene helps but expensive

6. Inject Se only if plasma is low

Se Injections

1. Effective if Se status is low
2. 50 mg (Holstein) 21 d prepartum
3. Associated with early calvings and low, but real risk of anaphylactic shock

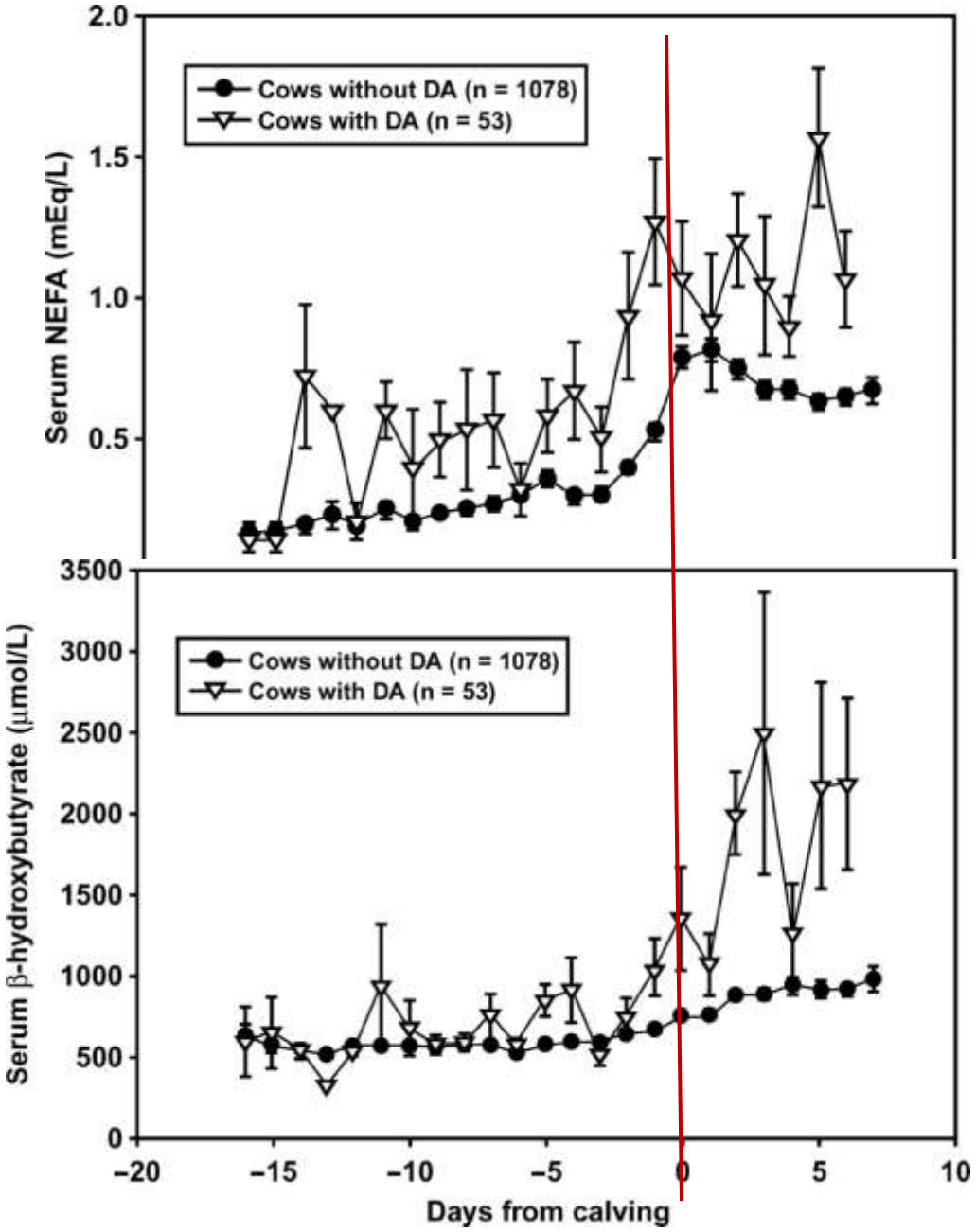
Plasma Se <0.05: Inject
Plasma Se > 0.075: Response unlikely

Displaced Abomasum (DA)

DA: General Information

1. US Prevalence is not decreasing, may be increasing (~5% of calving)
2. Not statistically related to herd milk yield
3. Milk reduction (5 studies, all significant)
    - 3.5 to 11 kg/d for 80 days
    - **0.8 to 2.5 kg/d for 305 days**

(Fourichon et al., 1999)



Negative energy balance prepartum

⇧ DA

NEFA > 0.5: RR 3.6X

Negative energy balance postpartum

⇧ DA

BHBA >1200: RR 8X

Milkfat:Prot>1.5: 3X

LeBlanc et al 2005

Nutrition and DA

To Prevent DA just do the following

1. Prevent hypocalcemia
2. Reduce drop in DMI prepartum
3. Obtain steady, rapid increase in DMI postpartum
4. Rumensin in dry cow diet might help

Rapid Increase in DMI Post-Calving

Comfortable cows eat more !

1. Adequate space: 1.2 headlocks and stalls per cow
2. Adequate access to clean, good water
3. Feed frequently (2 or more/day)
4. Give cows time to eat

Rapid Increase in DMI Post-Calving

Feed the right diet !

1. Highly digestible forage
2. Adequate but not excessive forage NDF (20 to 25%)
3. Moderate starch (~25%) and fiber (~30%)
4. Low supplemental fat (< 5% total fat)

Ketosis

Type 1 (classical ketosis)

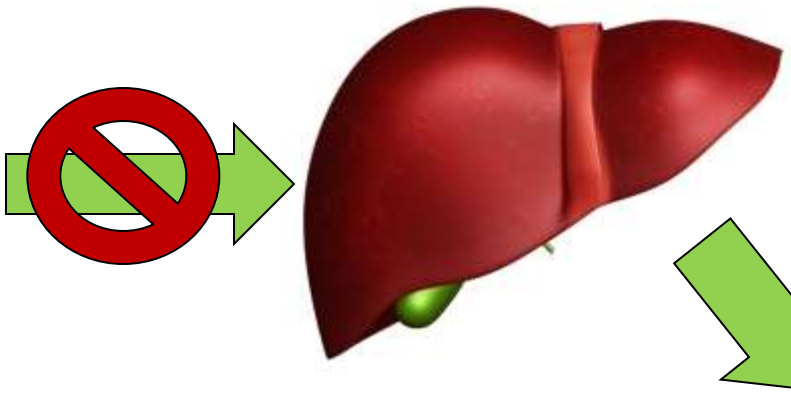
-Usually at 2 - 4 wk postpartum

- Responds well to glucose therapy

Type 1 Ketosis: Inadequate Substrate

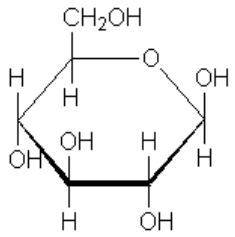
Propionate

Certain amino acids



Glucose

Type 1 Ketosis



Caused by inadequate supply of glucose

- not enough grain post partum
- excess fat in diet
- poor quality forage

Feed well-balanced diet post partum.
Make sure cows get enough starch (~25%)
and protein (>17%)

Ketosis

Type 2 (peripartum ketosis)

- Usually < 1 wk postpartum
- Often does not respond to glucose
- Almost always with fatty liver

Type 2 Ketosis: Inadequate Synthetic capacity

Propionate

Certain amino acids

Glucose

Type 2 Ketosis

Probably caused by build-up of liver fat **prepartum**

- Energy intake during entire dry period ?
- Energy intake during prefresh period ?
- Change in energy intake ?

NEL Intake

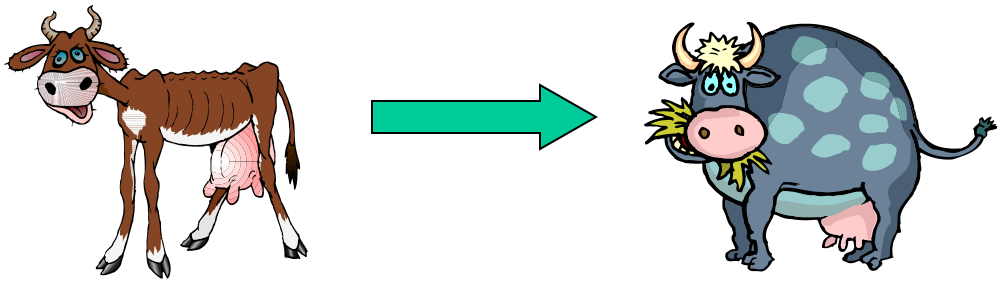
NEL requirement = 14 Mcal/d

DMI = 13.6 kg/d

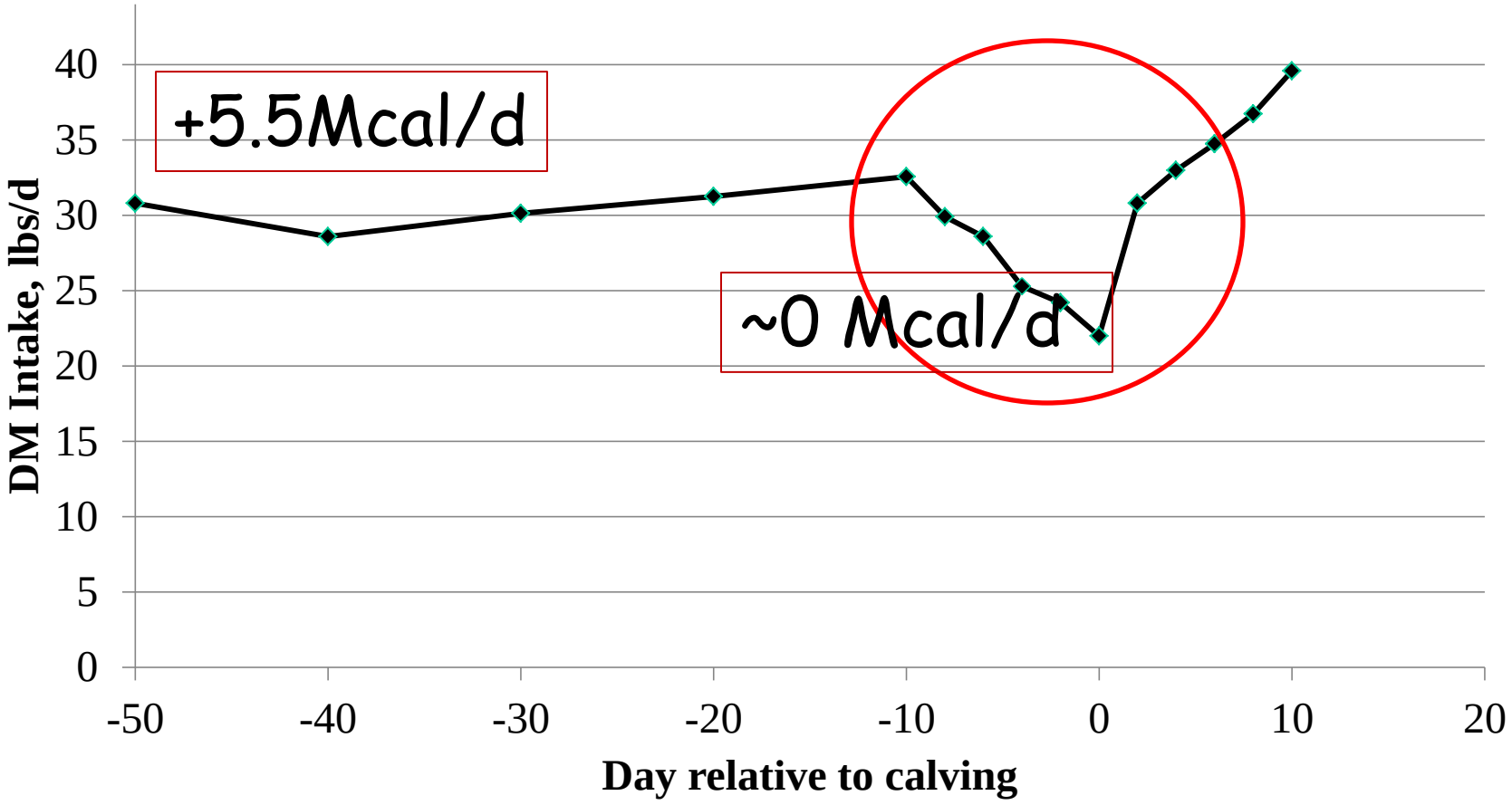
'Good quality' dry cow diet = ~1.44 Mcal/kg

13.6 kg x 1.44 = 19.5 Mcal/d **(+ 5.5 Mcal/d)**

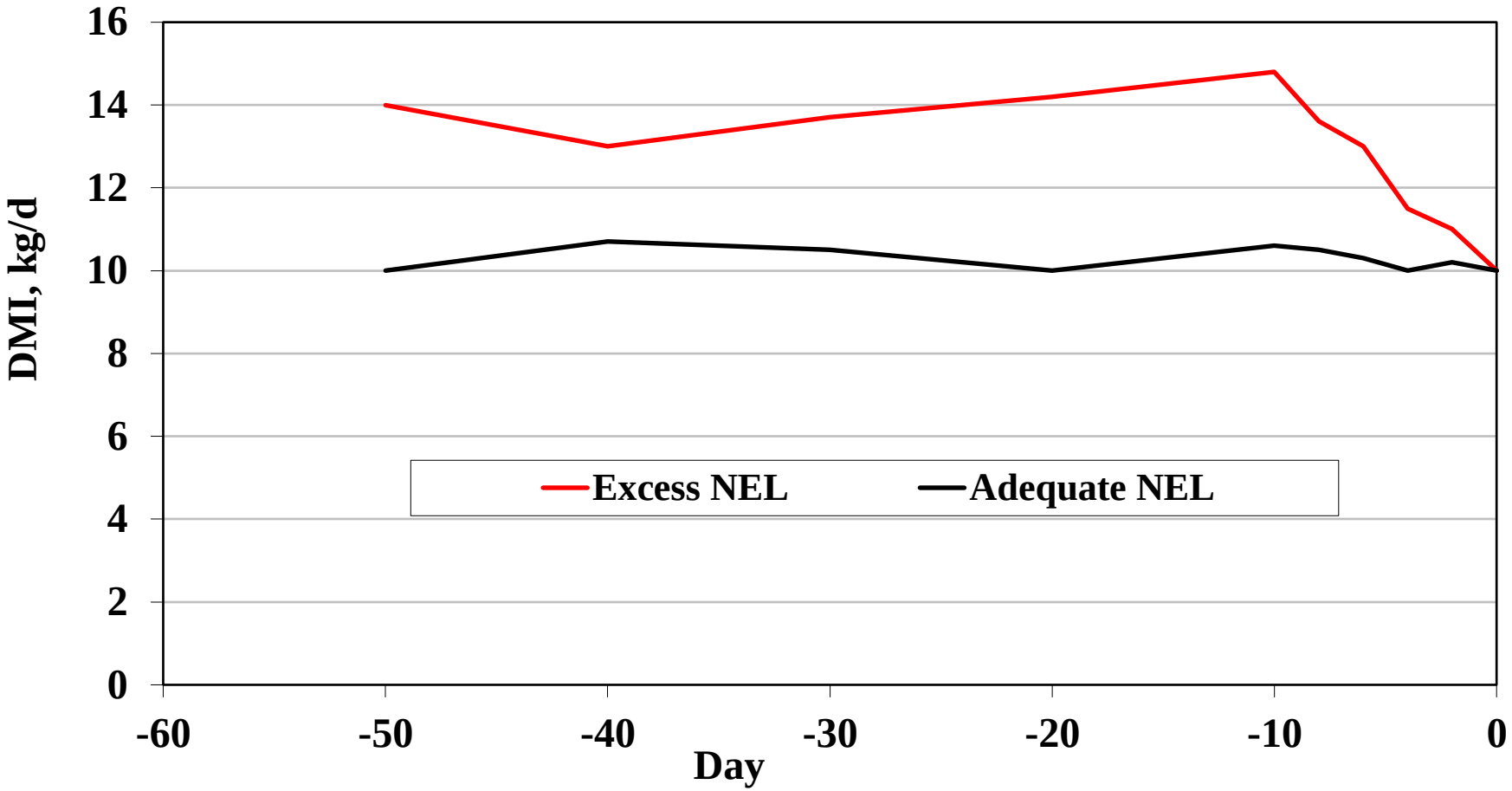
5.5 Mcal/d x 60 day = 330 Mcal = 0.7 BCS



Typical DMI during dry period and early lactation



Which is better ?



Type 2 Ketosis

1. Feed correct NEL for **whole** dry period
   - Avoid loss or gain in body fat

2. Feed a diet that fills up the cow without providing excess energy (high fiber)

Ketosis and Additives

RP-Choline (prefresh-early lactation

50 g/d may reduce fatty liver and ketones

Monensin (prefresh-early lactation)

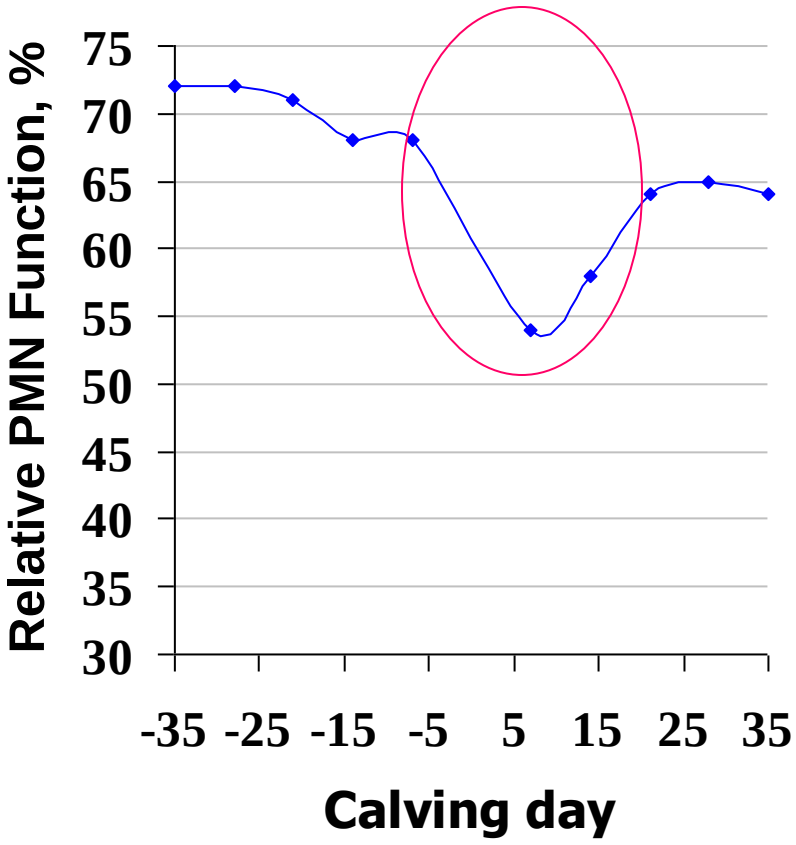
~350 mg/d reduces NEFA and ketones

Niacin

Data do not support effects on ketosis

Nutrition and Immune Suppression in the Peripartum Cow

Immuno-suppression



Kehrli, 2002

Around calving:

- ⇩ PMN function
- ⇩ Lymphocyte
- ⇩ Macrophage

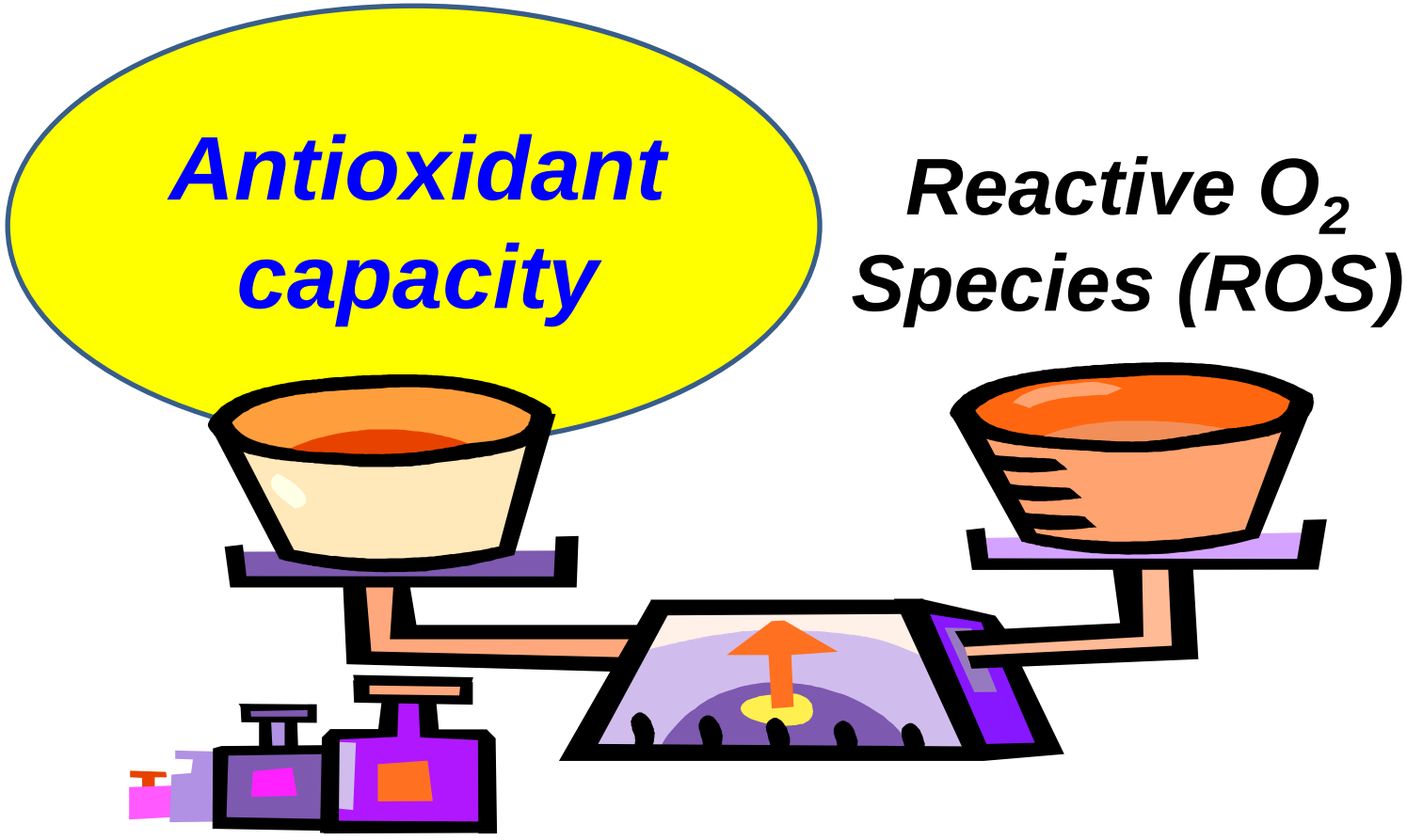
Reducing Immuno-suppressors

1. NEFA inhibits immune cell function
2. BHBA inhibits immune cell function
3. Immune cells have high requirement for Ca

Prevent hypocalcemia
Prevent ketosis
Avoid excess negative energy balance

Oxidative Stress:

[ROS] > Required



Why are cows in oxidative stress around calving?

1. Low intake of nutrients (low DMI)
2. Transfer of nutrients to fetus/colostrum
3. ROS may initiation of parturition
4. Giving birth generates ROS

Antioxidant Nutrients

Selenium

Vitamin E

Copper

Zinc

B-carotene (?)

Manganese

Iron

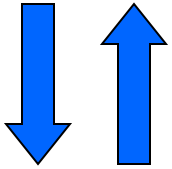
Vitamin C (?)

Often Deficient

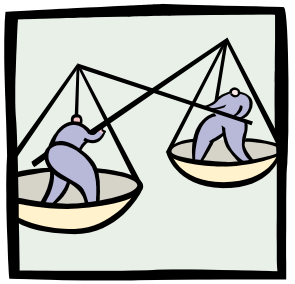
Deficiency Unlikely

Antioxidants can be Pro-oxidants

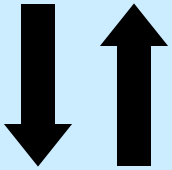
Cu is part of SOD (Antioxidant)



Cu^{++} is a potent pro-oxidant

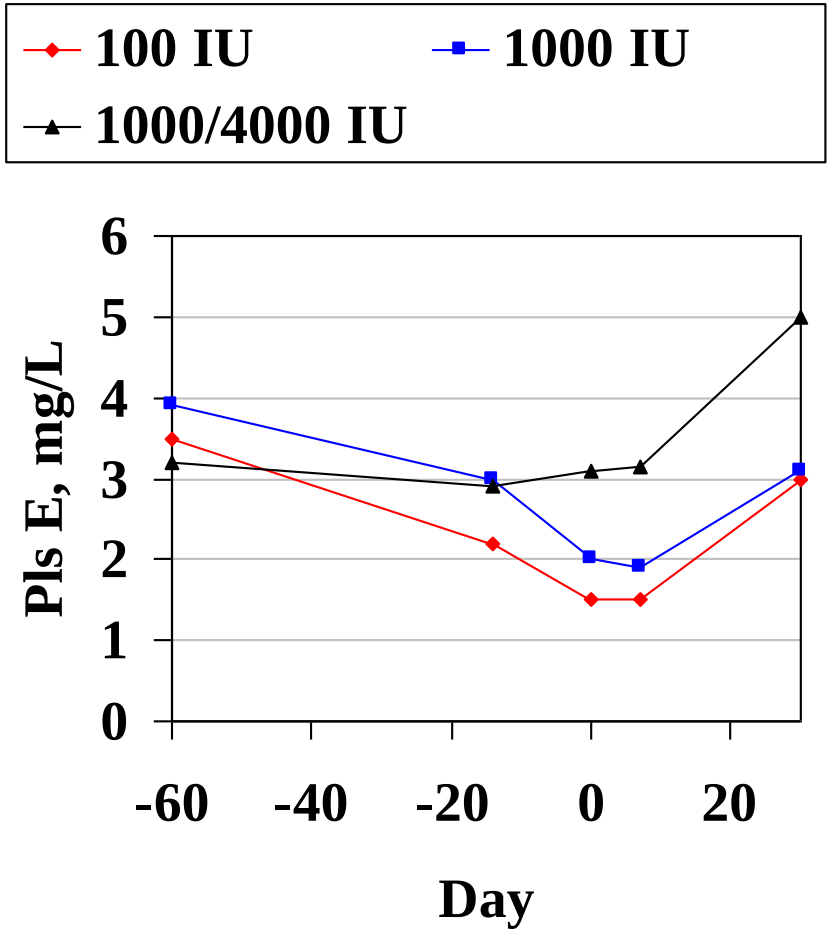


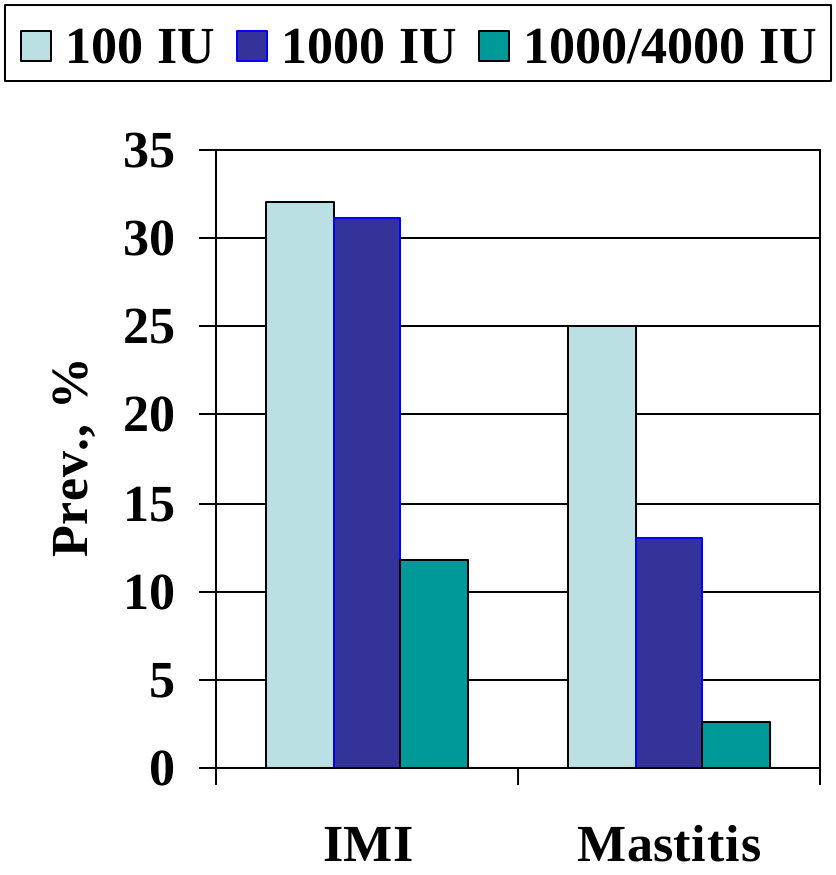
Fe is part of catalase (Antioxidant)



Fe^{++} is a potent pro-oxidant

Vitamin E and Periparturient Cows (cows fed 0.1 ppm Se)



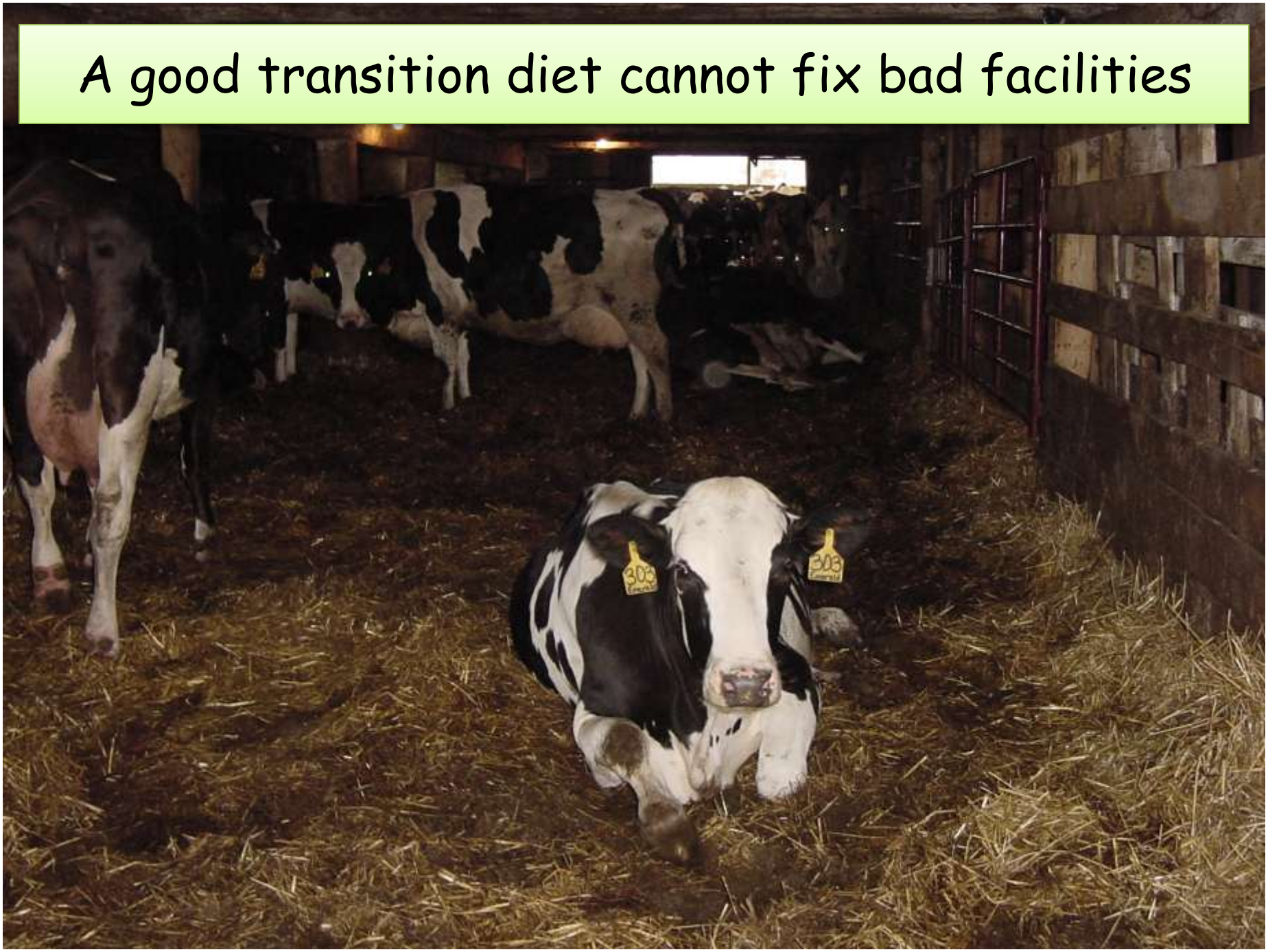


Weiss et al., 1997

Trace Nutrients During Transition (3 weeks pre to 3 weeks post)

1. No evidence supporting benefits of increased trace minerals
2. Higher vitamin E (+1000 to 4000 IU/day)
3. Maybe higher vitamin A (~150,000 IU/day)
4. Maybe supplemental B-carotene (300 to 500 mg/day

A good transition diet cannot fix bad facilities



A good transition diet cannot fix bad facilities

Conclusions

1. Balance minerals to **prevent hypocalcemia**
   - Calcium
   - Phosphorus
   - Potassium
   - Magnesium
   - DCAD

Conclusions

2. Maintain proper energy intake pre and post calving to **reduce ketosis**

   - Meet NEL during dry period
   - Feed high fiber to keep cow full
   - Promote high intake post partum
   - Feed adequate, not excessive starch

Conclusions

3. Maintain proper body condition pre and post calving to **reduce ketosis and DA**

   - Dry off at 3.5 BCS
   - Meet NEL during dry period
   - Promote high intake post partum
   - Limit supplemental fat pre and post

Conclusions

4. Feed trace nutrients to **maintain proper immune function**

   - Trace minerals slightly more than NRC
   - Extra vitamin E, prepartum
   - Consider extra vitamin A and B-carotene prepartum

http://dairy.osu.edu