Applied Beef Cow Nutrition

Grant Crawford, Ph. D.

October 7, 2016

Lewis and Clark Veterinary Conference

102nd Annual Meeting

South Sioux City, Nebraska

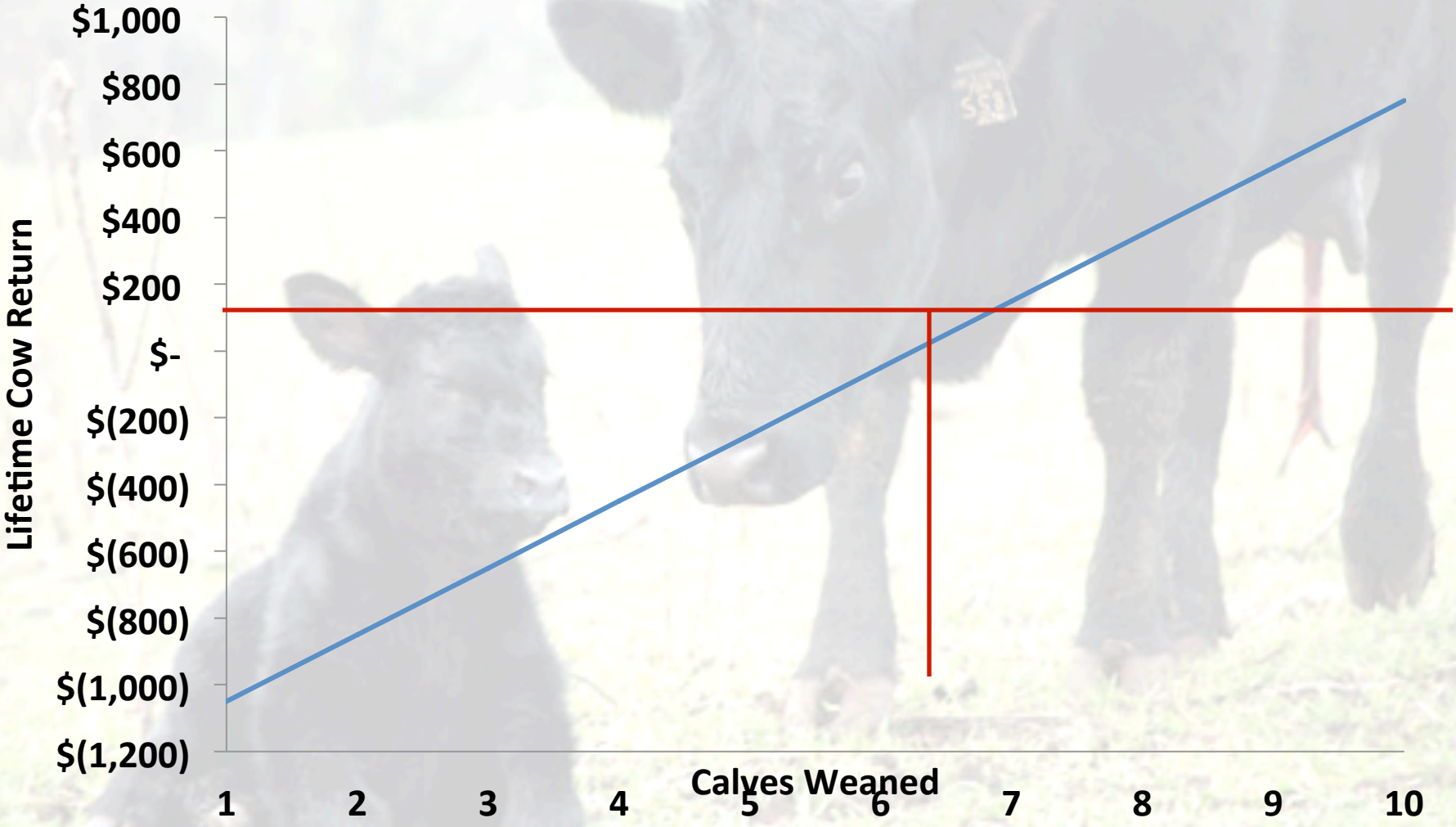
"The greatest loss in potential calves to wean is due to cows not becoming pregnant during the breeding season"

Bellows et al., 1979

Reproductive Expectations of the Beef Cow

- **Conceive within 80-90 days after calving**
  - **Dependent upon body condition at breeding**
  - **Influenced by nutritional status and suckling stimulus by calf**
- **Maintain pregnancy**
- **Support calf growth**
- **Do it again the next year**

Think LIFETIME Cow Return



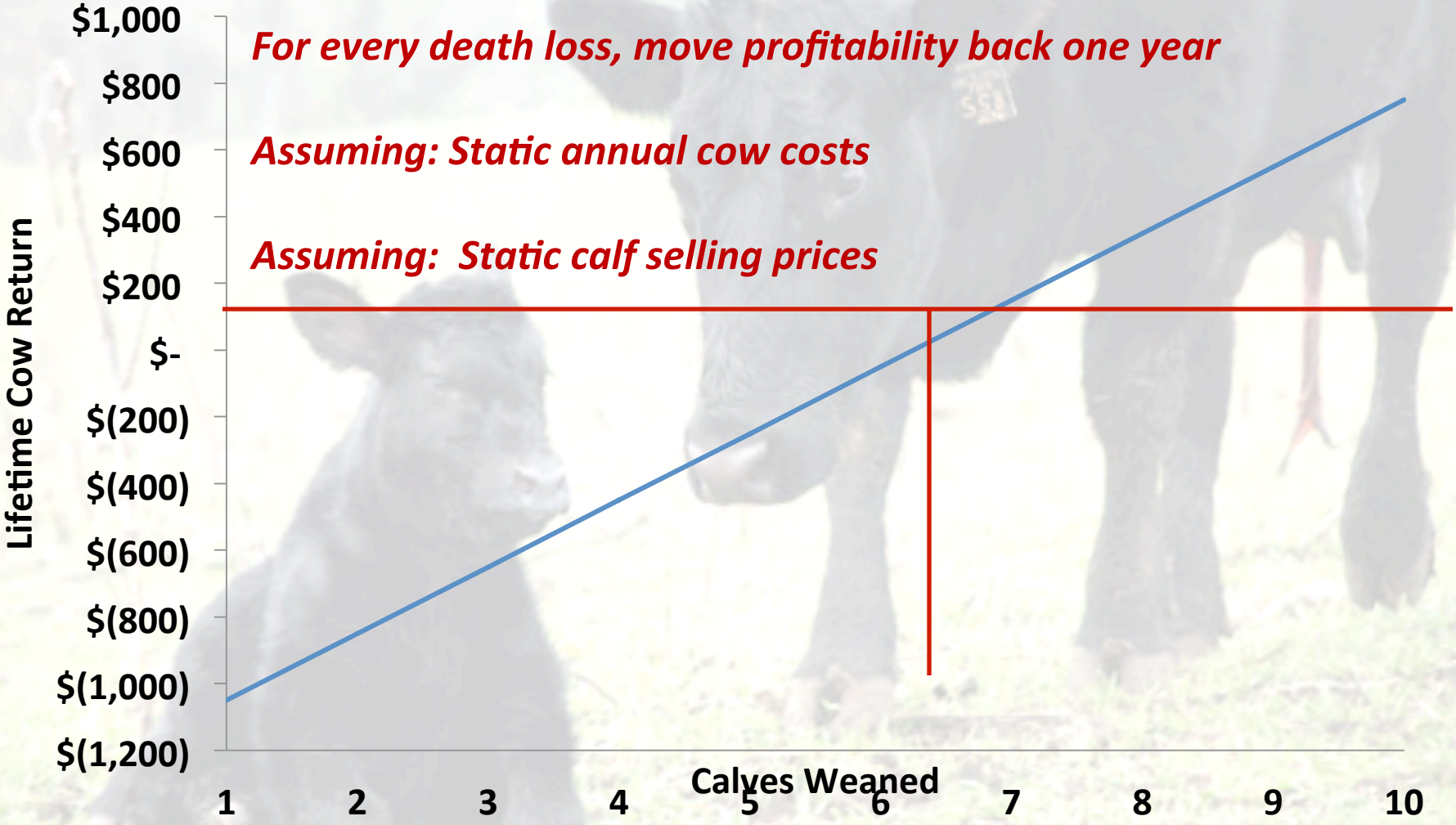
Think LIFETIME Cow Return

Assuming: No abortions/death loss

For every death loss, move profitability back one year

Assuming: Static annual cow costs

Assuming: Static calf selling prices

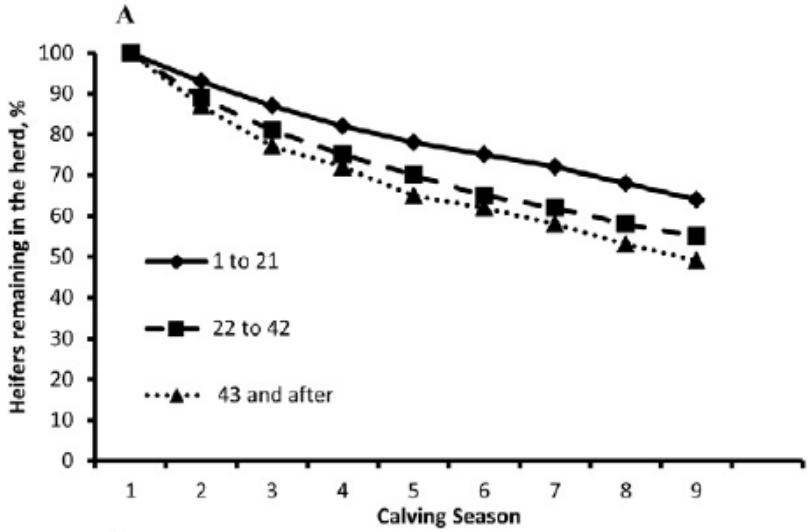


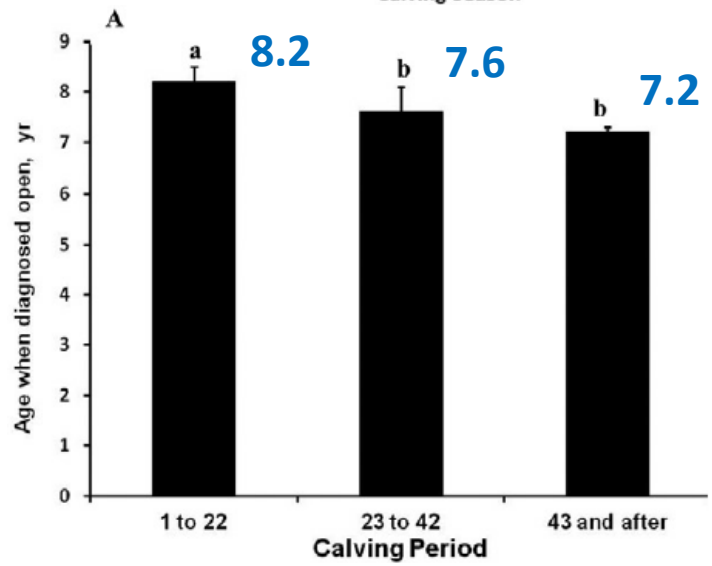
Effect of First Calving Date on Cow Longevity

- **Cushman et al., 2013 J. Anim. Sci.**
  - **20 years of data**
    - **South Dakota (2,195 head)**
    - **Nebraska USDA MARC (16,549 head)**
  - **Evaluated longevity in the herd based on first-calf heifer calving date**
    - **Broken into 21-d calving intervals**

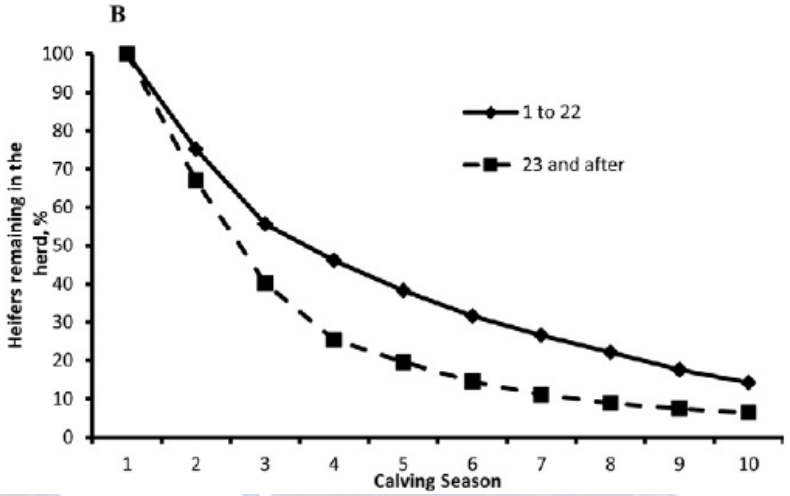
Effect of First Calving Date on Cow Longevity

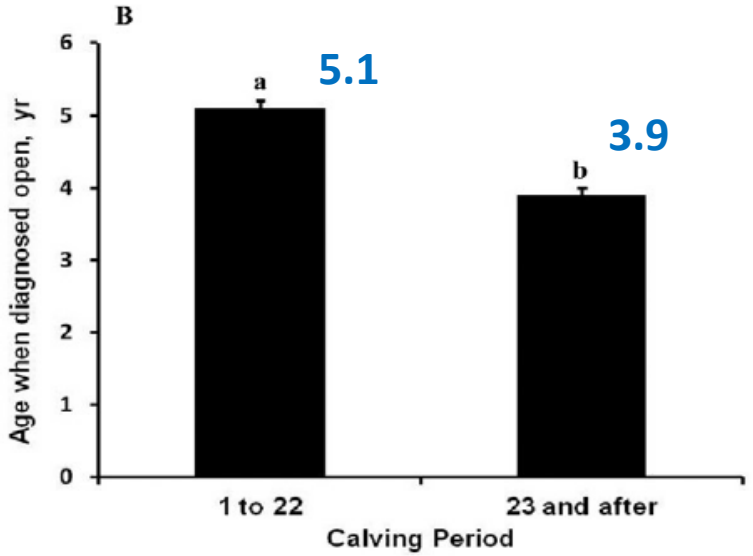
Nebraska





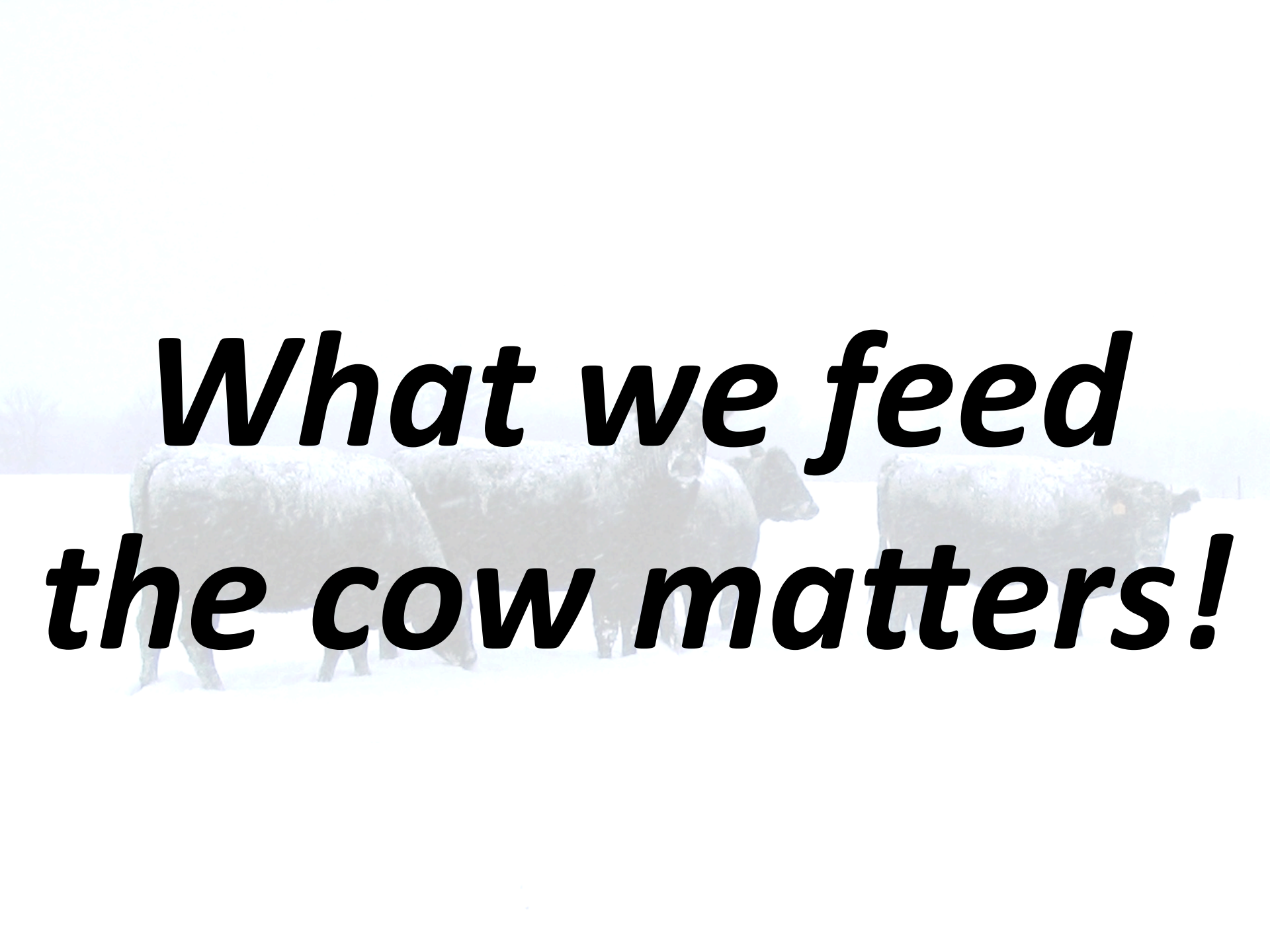
South Dakota

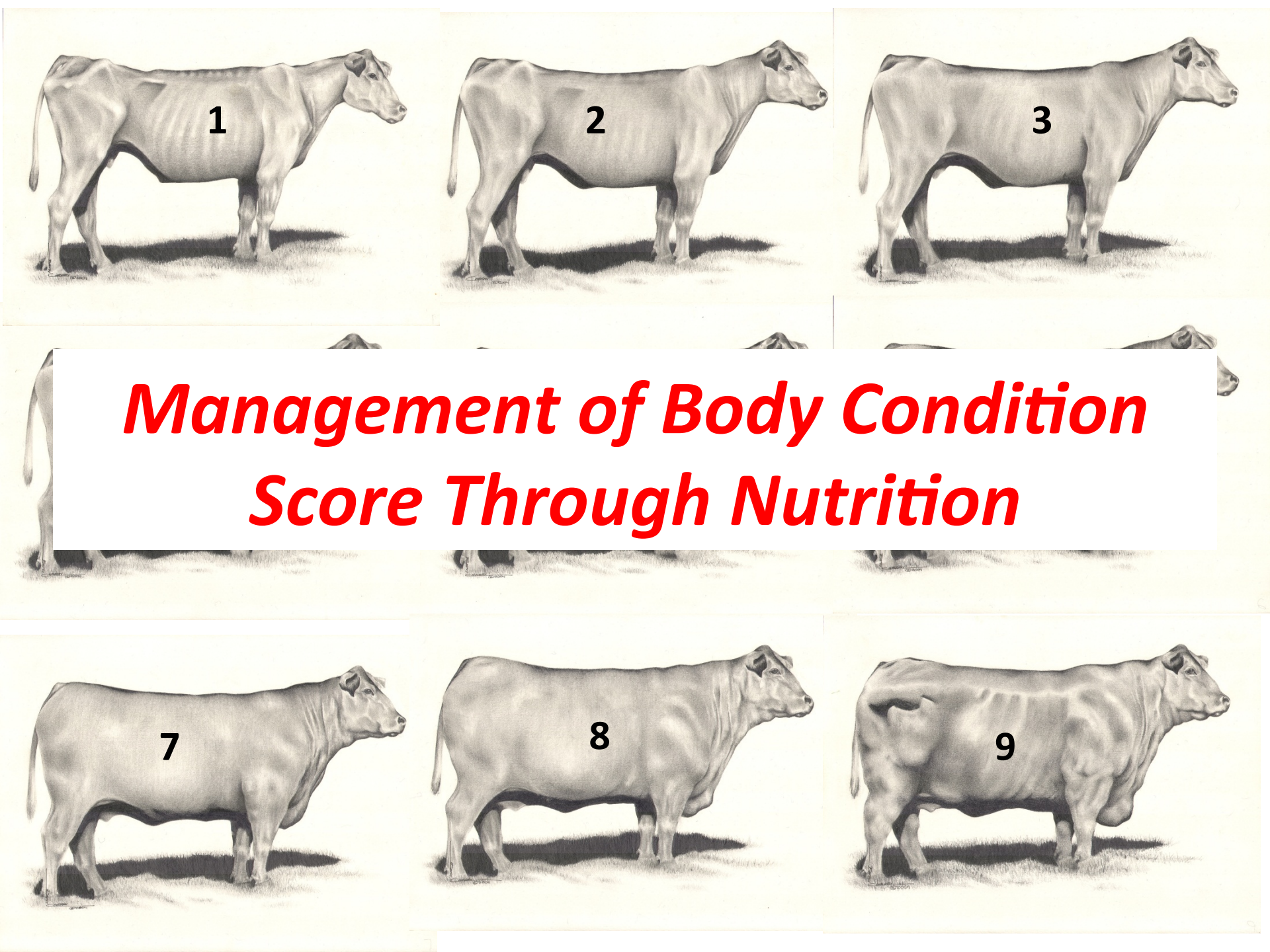




"The most important factor influencing pregnancy rate is body reserves at calving"

Wetteman et al., 2003 J. Anim. Sci.

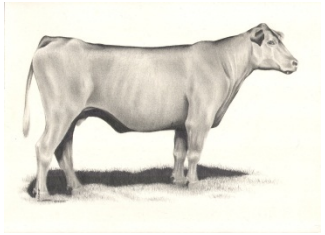

What we feed
the cow matters!



Management of Body Condition Score Through Nutrition

Effect of Cow Body Condition on Reproductive Performance and Calf Performance

BCS	Preg Rate, %	Calving Interval, d	Calf ADG, lb	Calf WW, lb
3	43	414	1.60	374
4	61	381	1.75	460
5	86	364	1.85	514
6	93	364	1.85	514



Adapted from Kunkle et al., 1994

Effect of Cow Body Condition on Reproductive Performance and Calf Performance

Effect of cow condition at calving on calf serum immunoglobulin level.

	Cow Body Condition Score				
	3	4	5	6	P-Value
Calf serum IgM (mg/dl)	146	157	193	304	.05
Calf serum IgG (mg/dl)	1998	2179	2310	2349	.23

Adapted from Odde, 1997, Proceedings Bovine Connection to Profit.

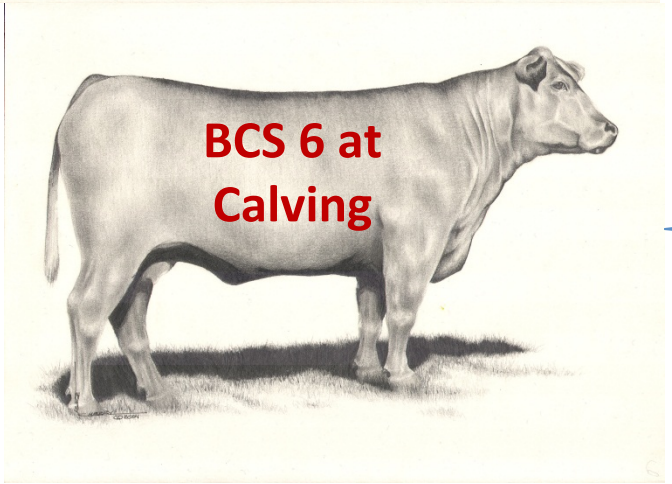
Effect of Cow Body Condition on Reproductive Performance and Calf Performance

Effect of low or high gestation feeding level on calving and subsequent reproduction.[a]

	Low	High
Calf Traits		
Calf birth weight (lbs)	63	69
Dystocia (%)	35	28
Calf survival at birth (%)	93	91
Calf survival at weaning (%)	58	85
Scours incidence (%)	52	33
Mortality due to scours (%)	19	0
Dam Traits		
Estrus at the beginning of the breeding season (%)	48	69
Pregnancy (%)	65	75

[a] Summary of seven research trials by Bob Bellows, USDA-ARS, Miles City, Mont. Range Beef Cow Symposium XIII, 1993, pp. 175-189. Cows on low plane of nutrition lost weight. Cows on high plane of nutrition gained weight.

Effect of Calving BCS on Subsequent Re-Breeding

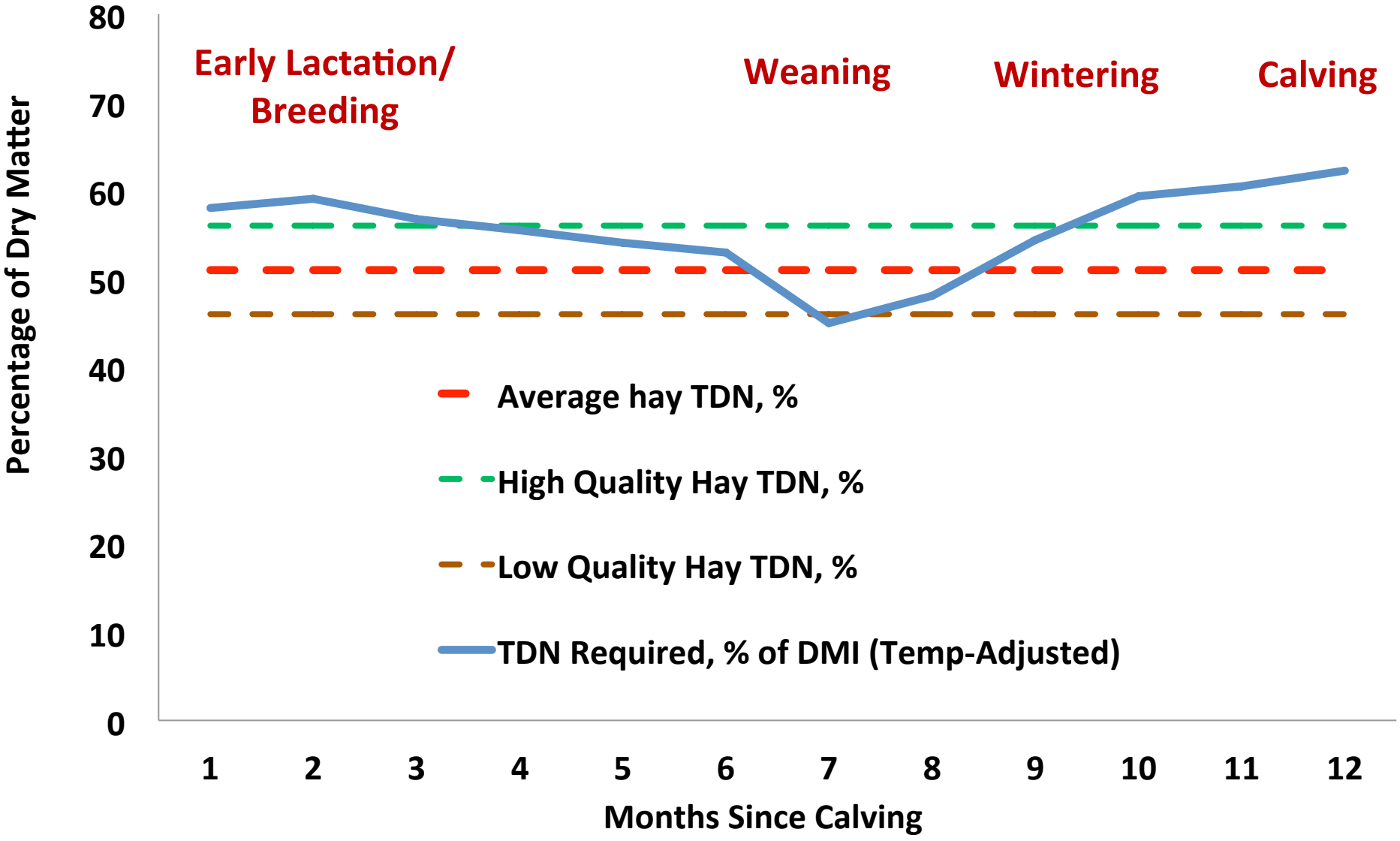


Post-Calving Average Daily Gain	Percent cycling 20 days post-calving
0.4 lbs	33%
0.9 lbs	50%
0.4 lbs	40%
0.9 lbs	85%

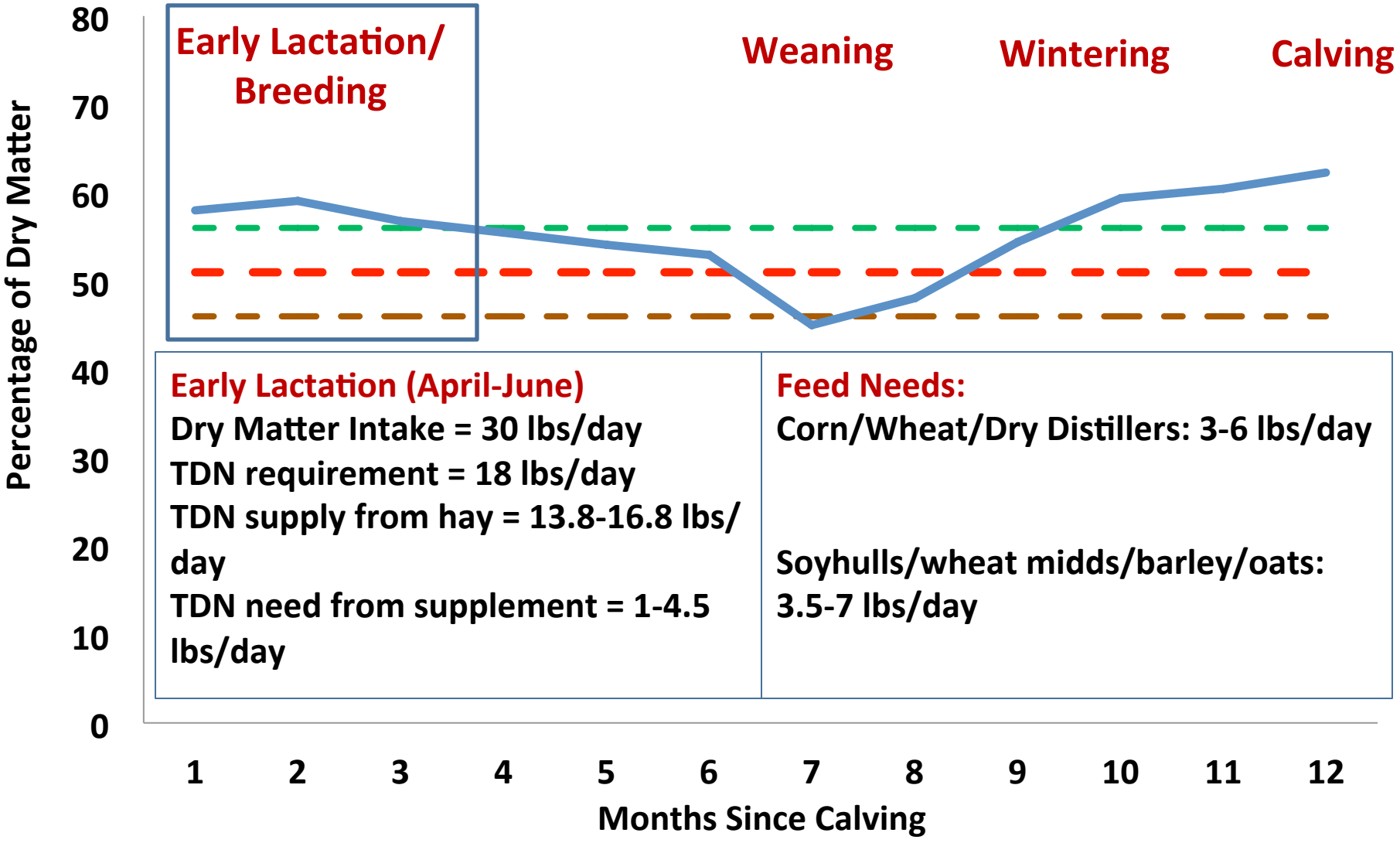
Spitzer et al., 1995 J. Anim. Sci.

Nutrient Requirements for Cows

Temperature-Adjusted



How much feed supplement is needed?



Early Lactation (April-June)

Dry Matter Intake = 30 lbs/day

TDN requirement = 18 lbs/day

TDN supply from hay = 13.8-16.8 lbs/day

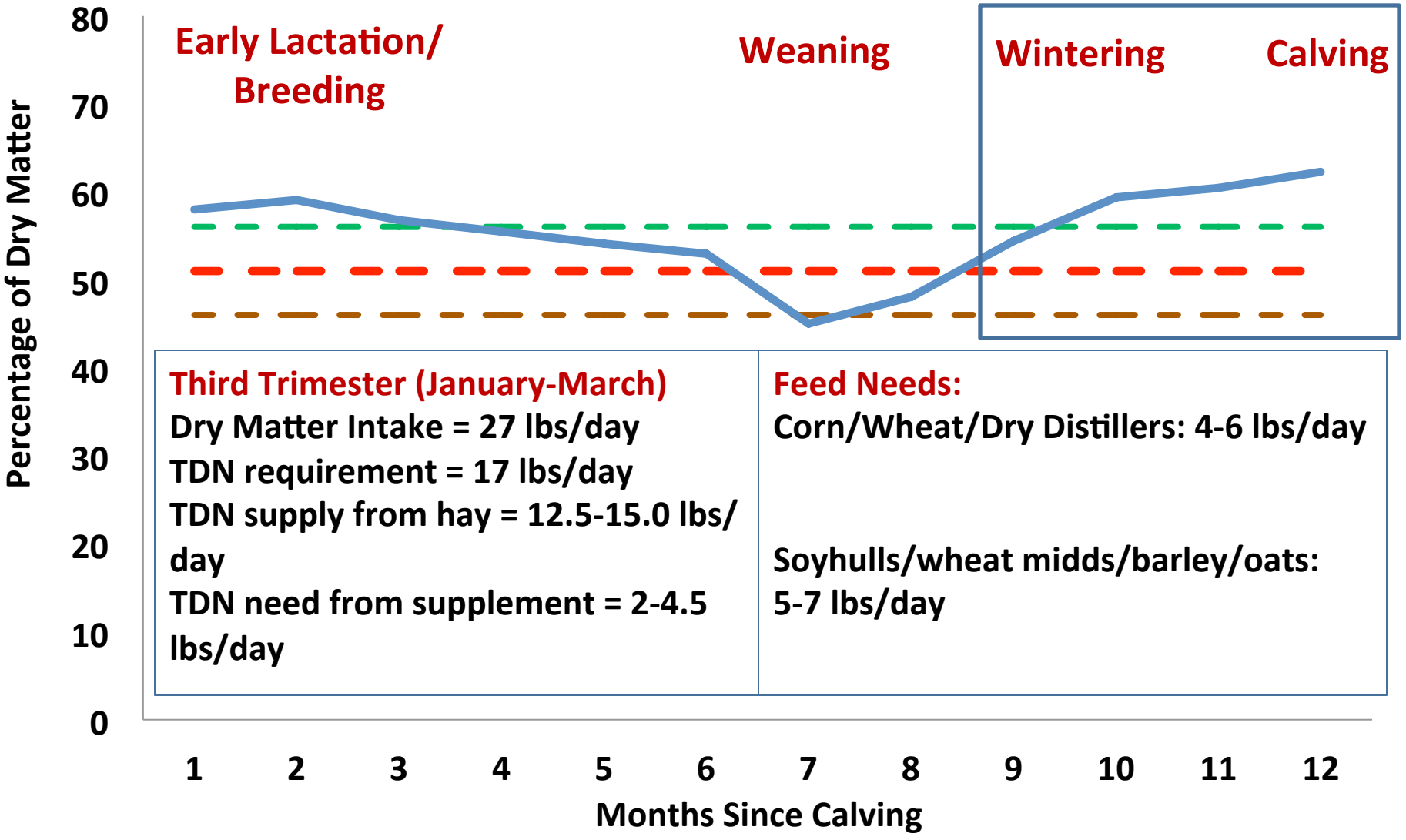
TDN need from supplement = 1-4.5 lbs/day

Feed Needs:

Corn/Wheat/Dry Distillers: 3-6 lbs/day

Soyhulls/wheat midds/barley/oats: 3.5-7 lbs/day

How much supplement is needed?



Third Trimester (January-March)

Dry Matter Intake = 27 lbs/day

TDN requirement = 17 lbs/day

TDN supply from hay = 12.5-15.0 lbs/ day

TDN need from supplement = 2-4.5 lbs/day

Feed Needs:

Corn/Wheat/Dry Distillers: 4-6 lbs/day

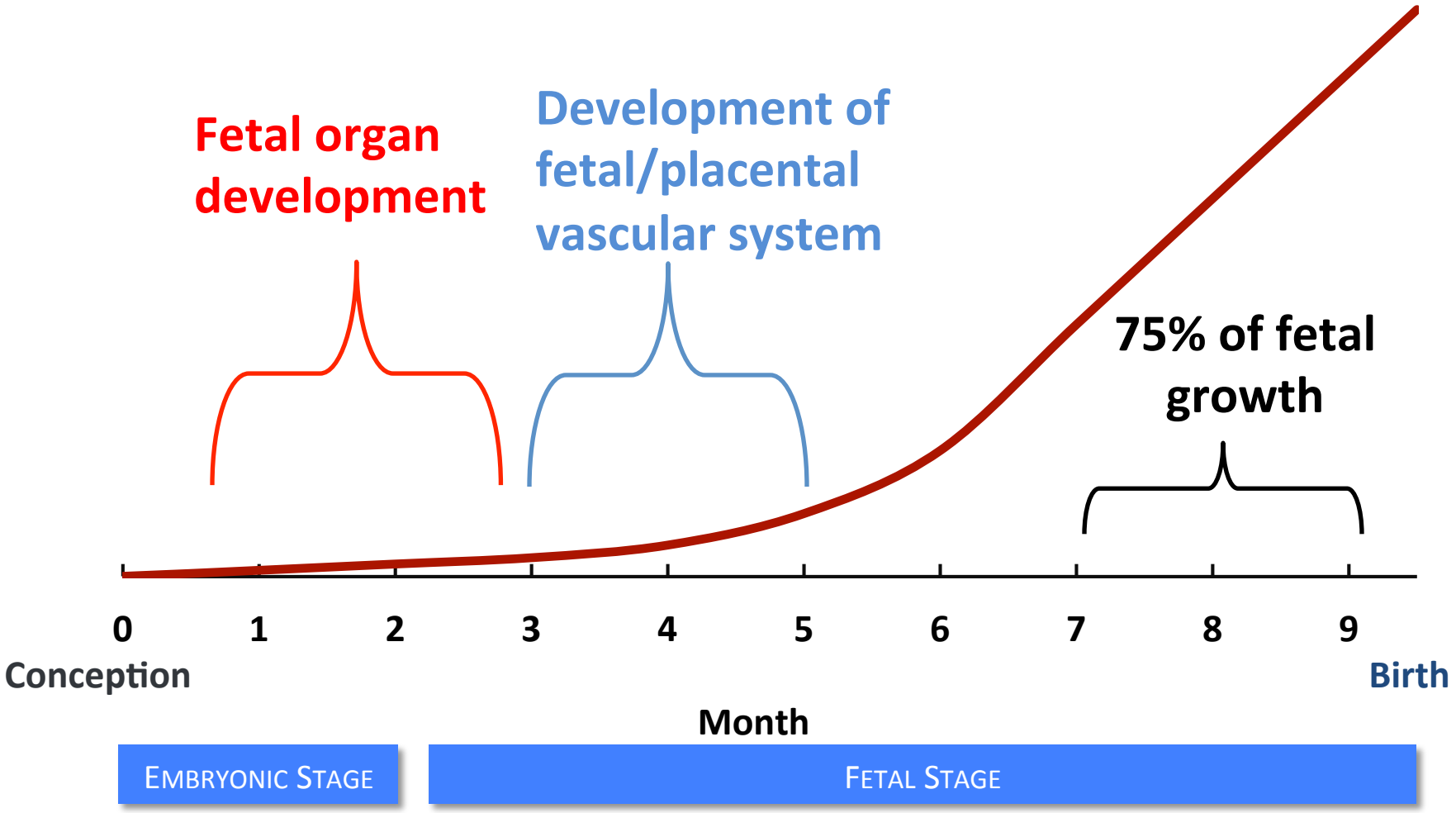
Soyhulls/wheat midds/barley/oats: 5-7 lbs/day

Effect of early-gestation nutrition on fetal development

- **Fetal/placental vascularization begins around day 90, with a marked increase in blood flow by day 120.**

- **Fetal growth restriction during this time is correlated with reduced placental growth and development (*Reynolds and Redmer, 1995; 2001).***

Fetal Development



Mid-Gestation Nutrition Matters

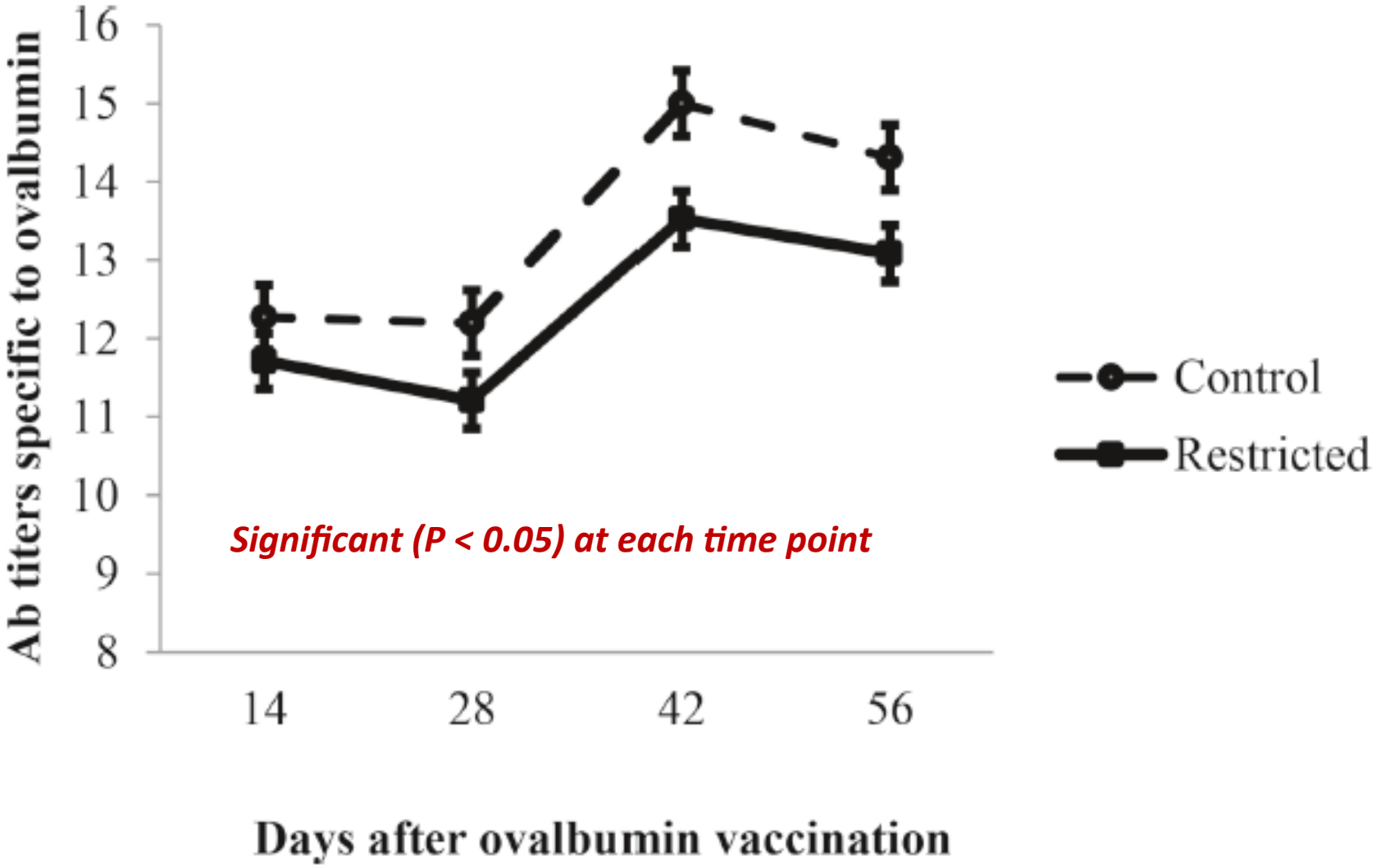
- **Taylor et al., 2016 Prof. Anim. Sci. (SDSU)**
  - **2nd trimester cows**
    - **Fed to achieve/maintain BCS 5.0-5.5 (Control)**
    - **Fed 80% of energy requirement (Restricted)**
  - **After 91 days, all cows fed/grazed together**
  - **After weaning, calves backgrounded and finished in feedlot**
    - **Performance measured, ovalbumin challenge 19 d after feedlot entry**

Mid-Gestation Nutrition Matters

- **During 2nd trimester:**
  - **Control cows gained 117 lbs and gained 0.18 pts BCS**
  - **Restricted cows lost 53 lbs and lost 0.63 pts BCS**
- **Calves:**
  - **No difference in birth weight, weaning weight**
  - **No differences in feedlot performance**

- **However…..**

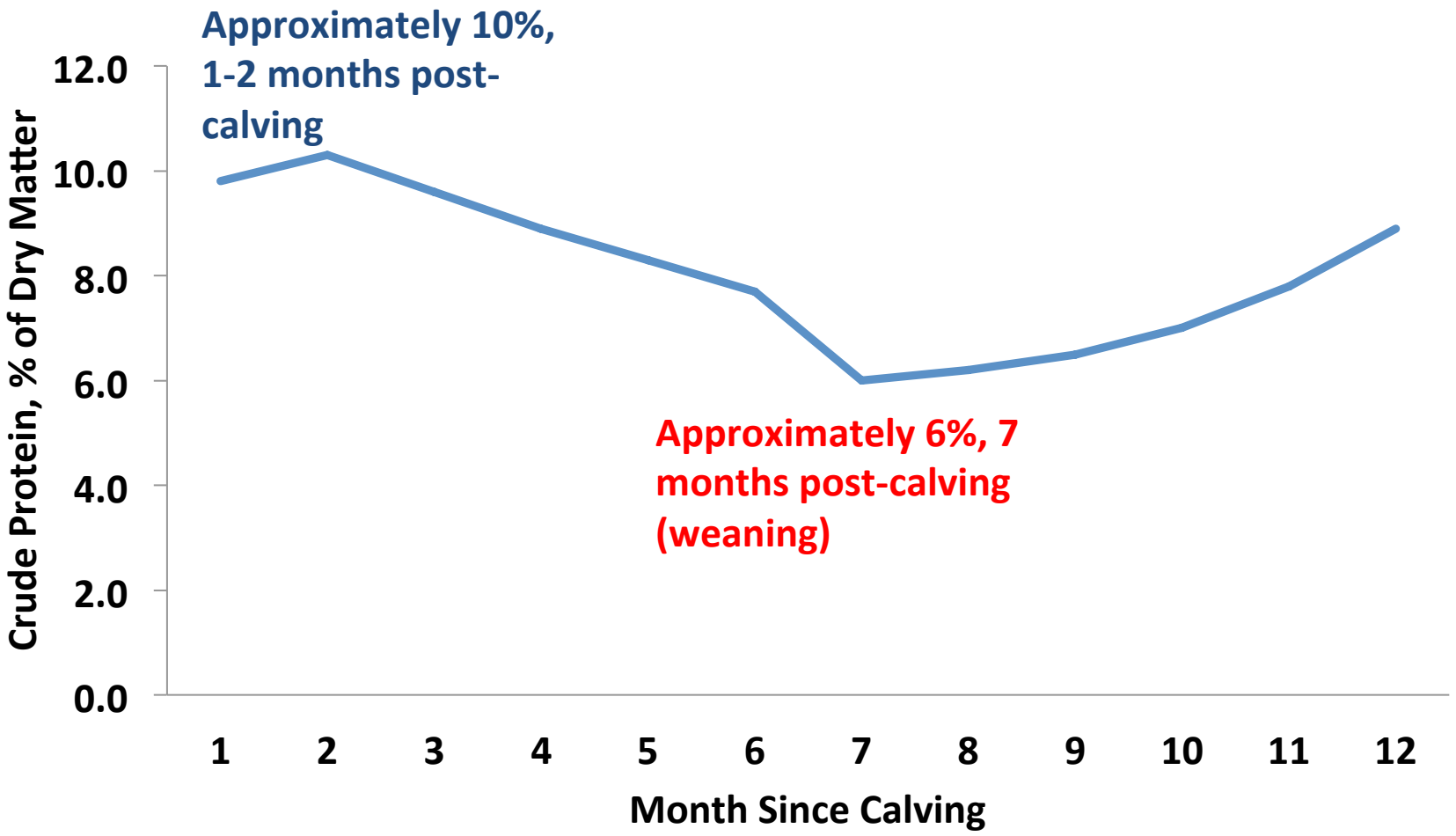
Mid-Gestation Nutrition Matters



Don't Forget About Protein!

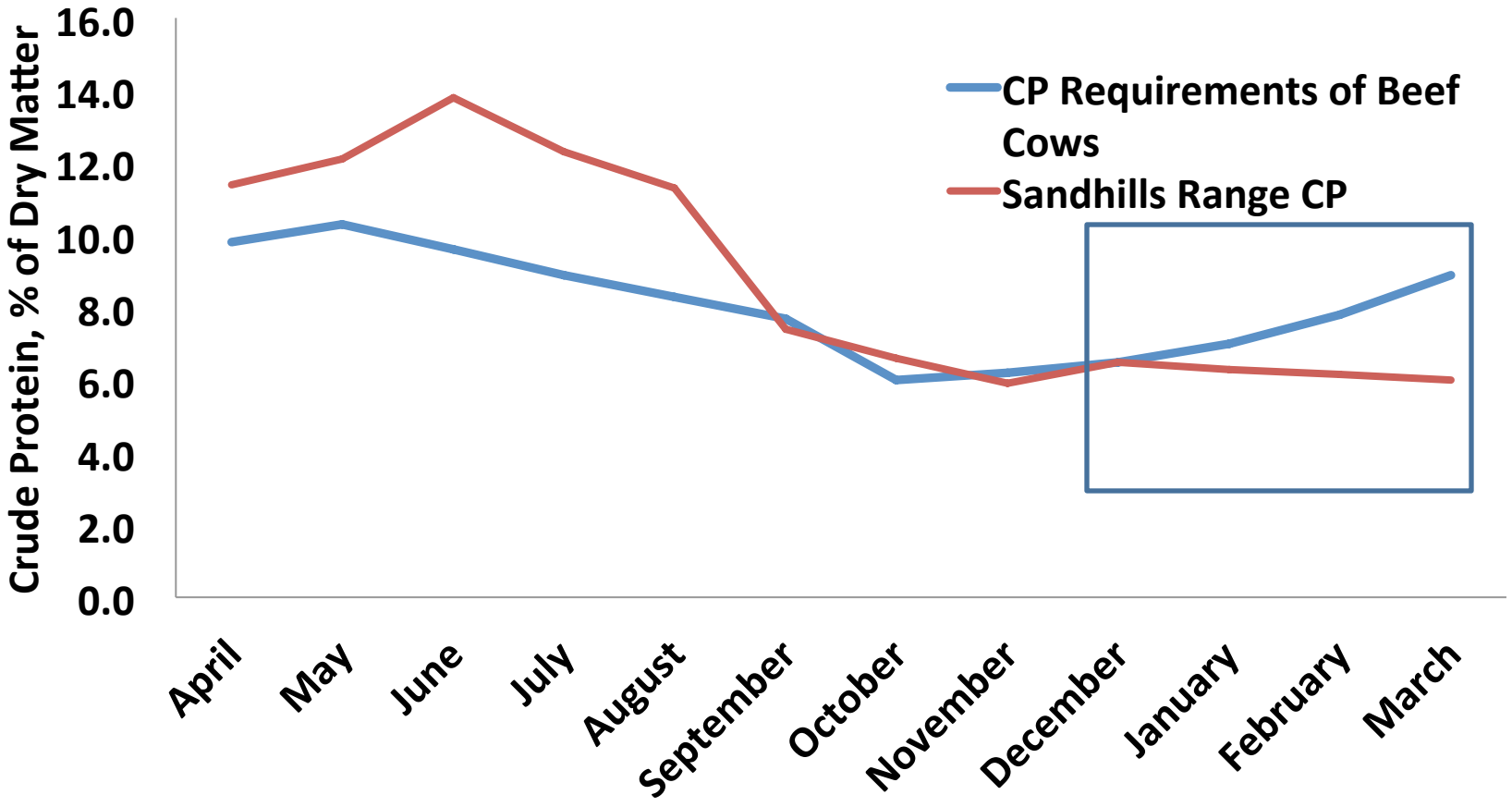
- **Focus of beef cow protein nutrition is often on third trimester**
- **However, range forages may be deficient in protein in mid-summer and early fall**
  - **Particularly when drought-stressed**
- **Range forages also decrease in digestibility over time, which decreases nutrient intake and absorption**

Protein Requirements for Beef Cows



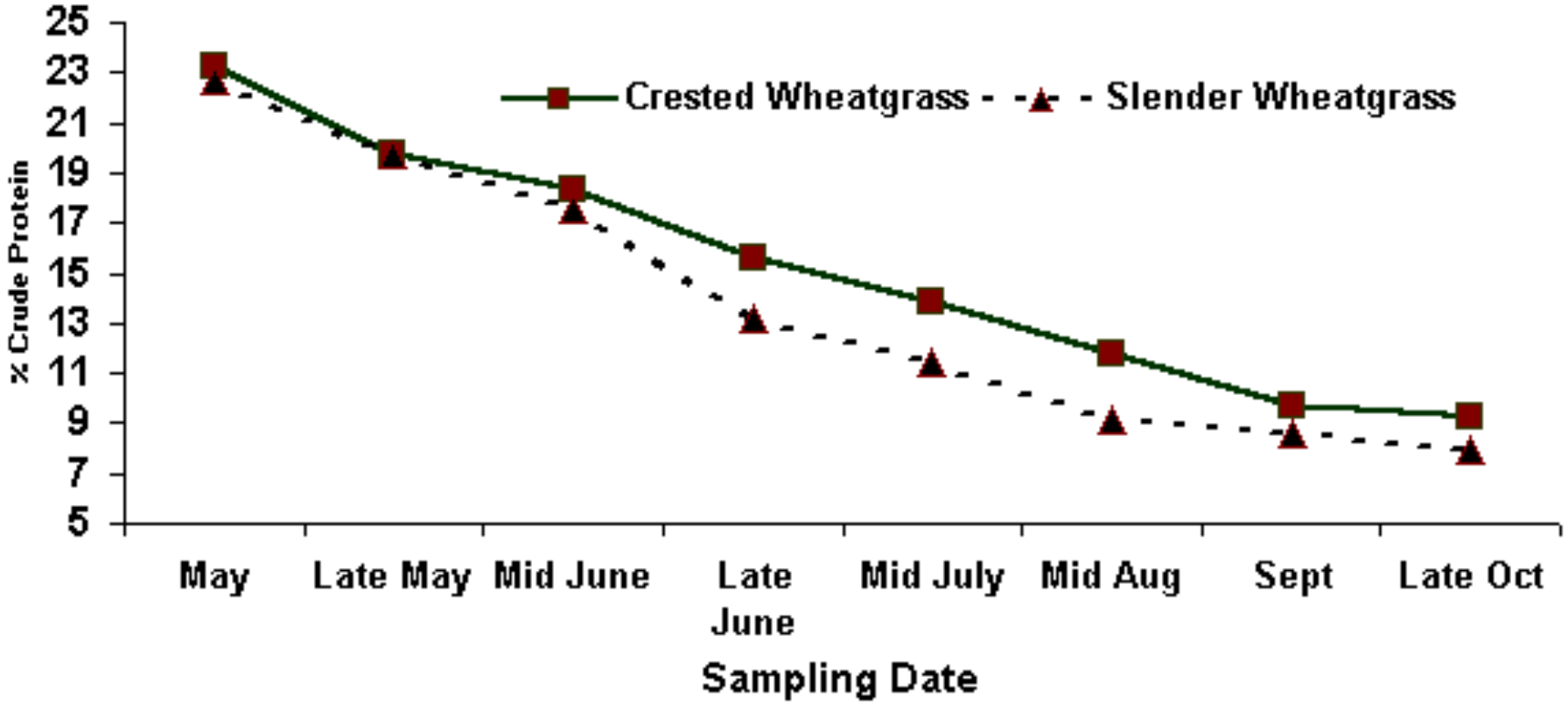
NRC, 1996

Protein Requirements for Beef Cows



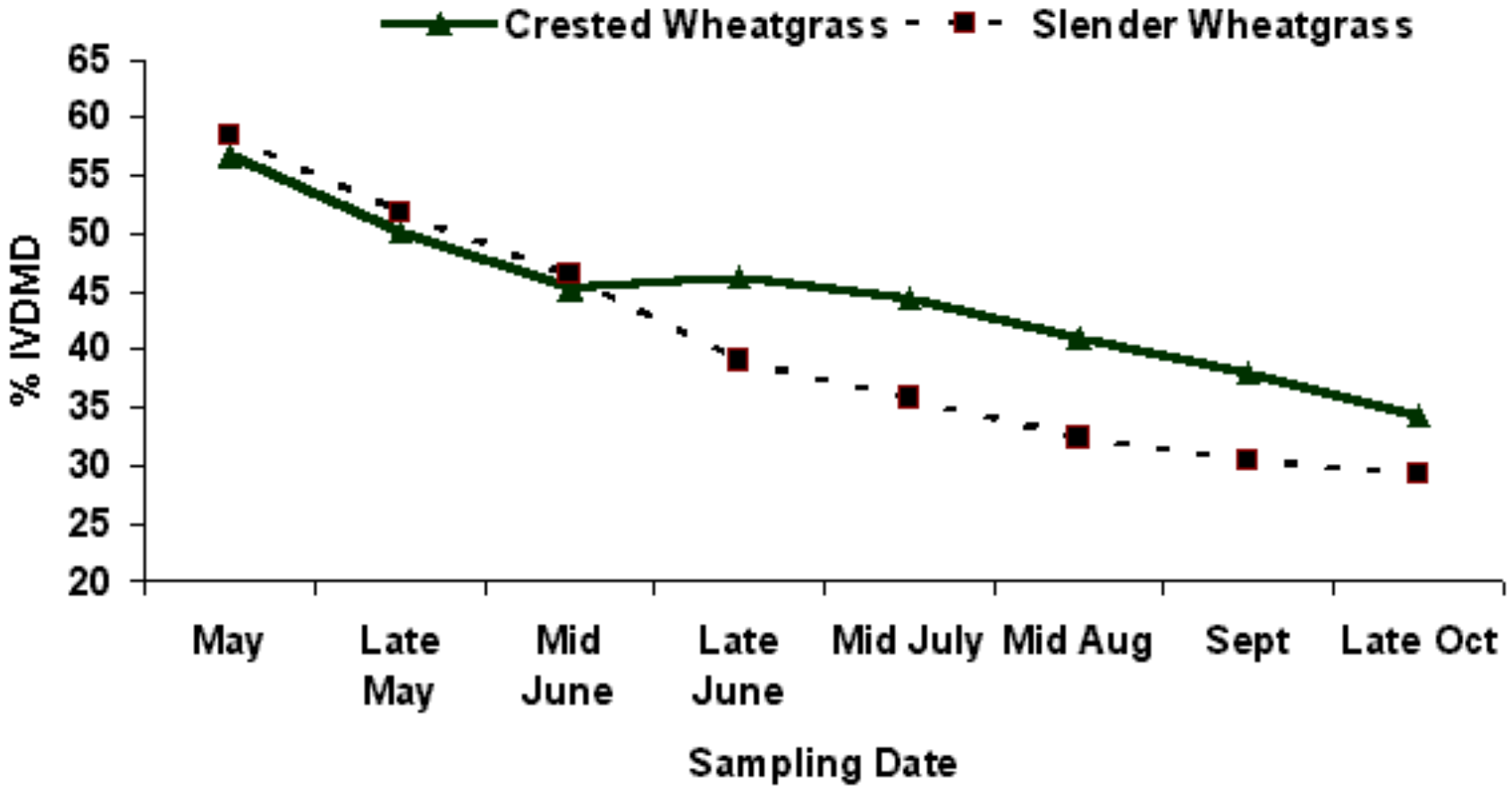
Assuming March Calving. NRC, 1996 and Lardy et al., 2004

Nutrient Changes Over Time



Blunt and Cash, Unpublished data. Adapted from Paterson et al., 2001

Nutrient Changes Over Time



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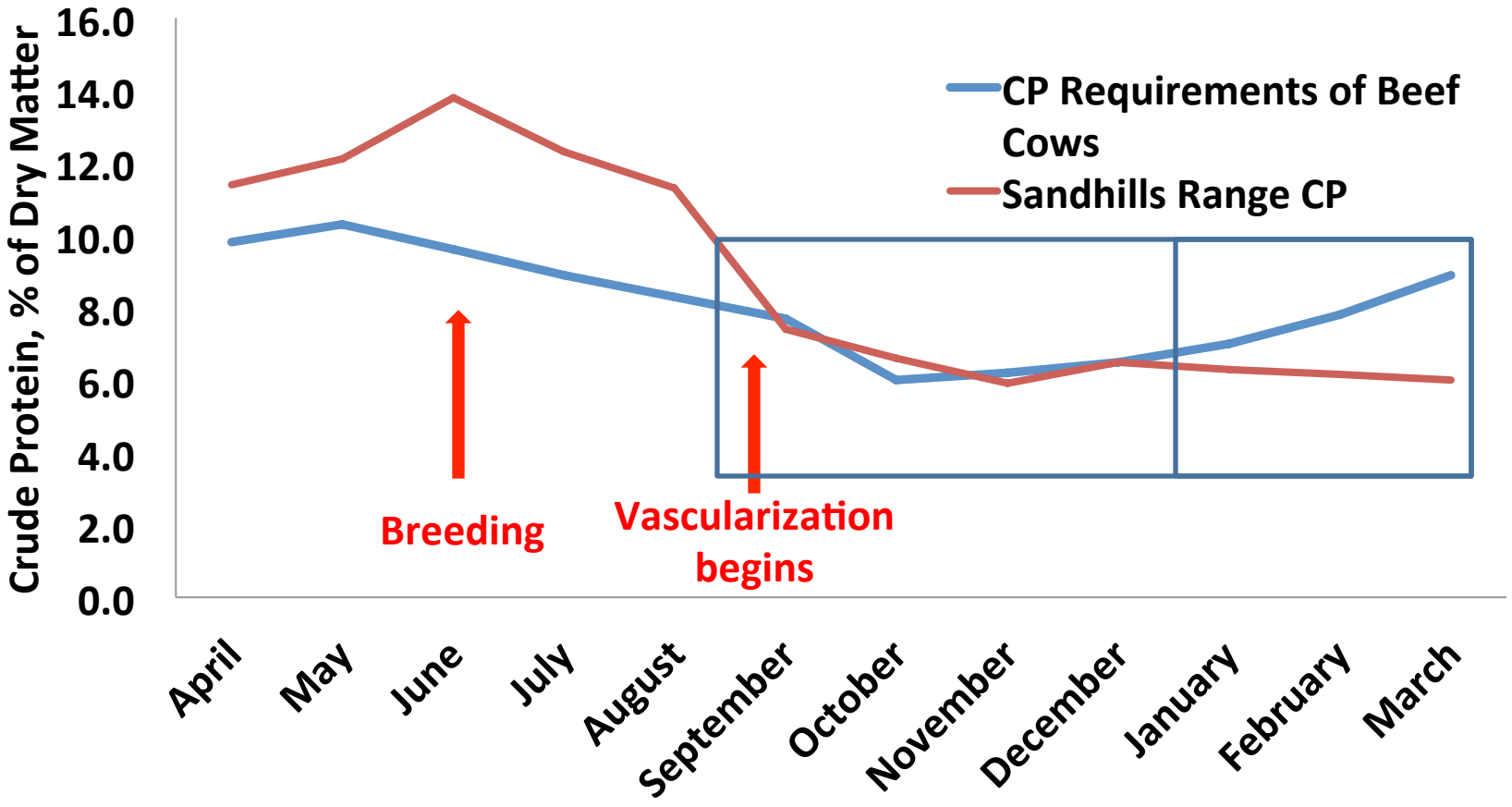
Effect of protein nutrition on subsequent calf health and performance

- **Protein supplementation during gestation reduces feedlot pull rate (Mulliniks et al., 2008; Larson et al., 2009).**
- **Late gestation protein increased WW and pre-weaning ADG (Stalker et al., 2005; 2006; Larson et al., 2009).**
- **Heifers from nutritionally-restricted dams had offspring with lighter birth weights and WW than heifers from adequate-protein dams (Roberts et al., 2009).**

Protein Requirements for Beef Cows



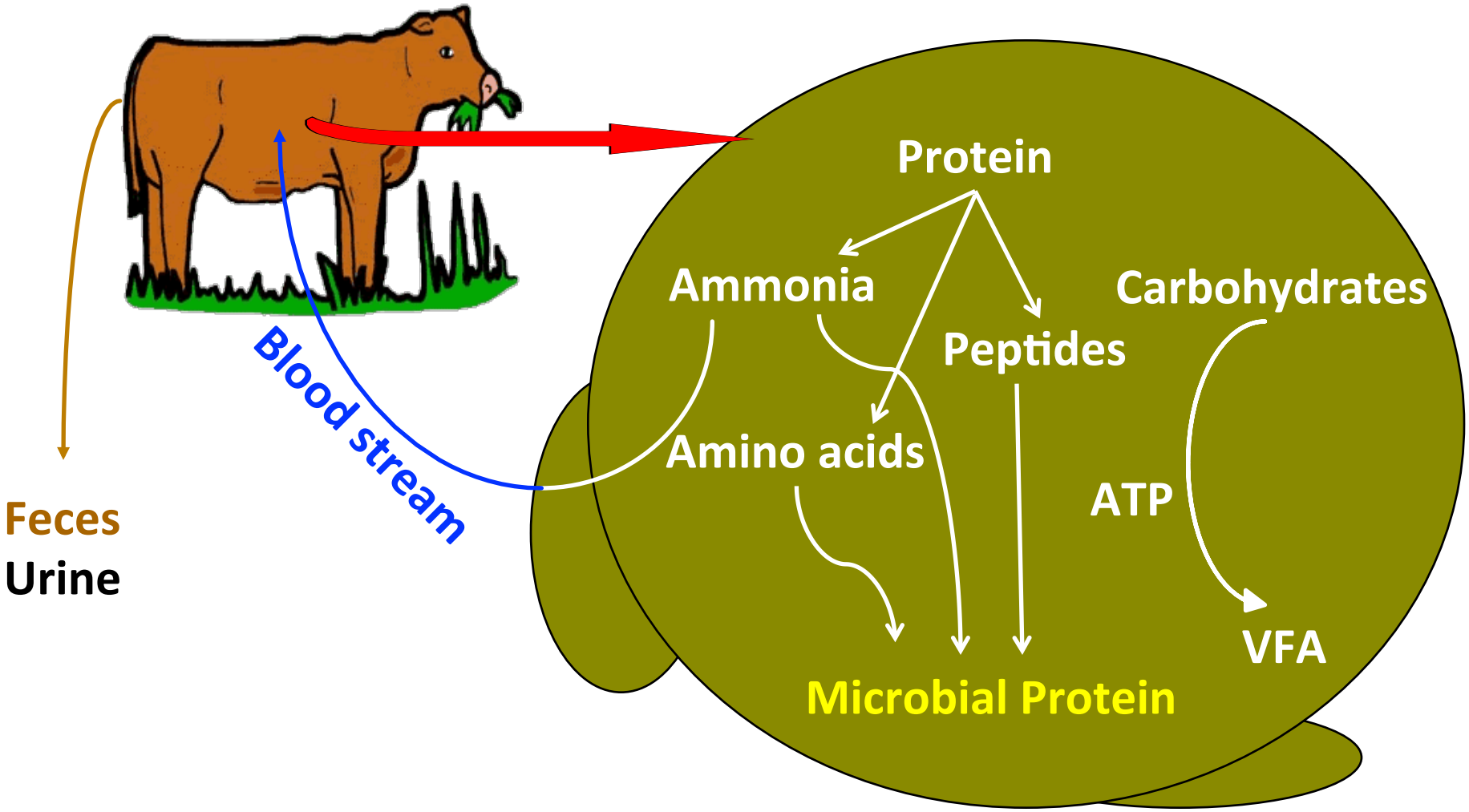
Assuming March Calving. NRC, 1996 and Lardy et al., 2004

Protein Overview

- **Crude protein values only tell part of the story**

- **Two "types" of protein**
  - **Degradable intake protein (DIP)**
    - **Broken down by microbes in rumen**
    - **Used to form microbial protein**
  - **Undegradable intake protein (UIP)**
    - **Bypass protein, escape protein**
    - **Absorbed in small intestine**
  - **Feedstuffs vary in amounts of DIP and UIP**
    - **Vary throughout season**

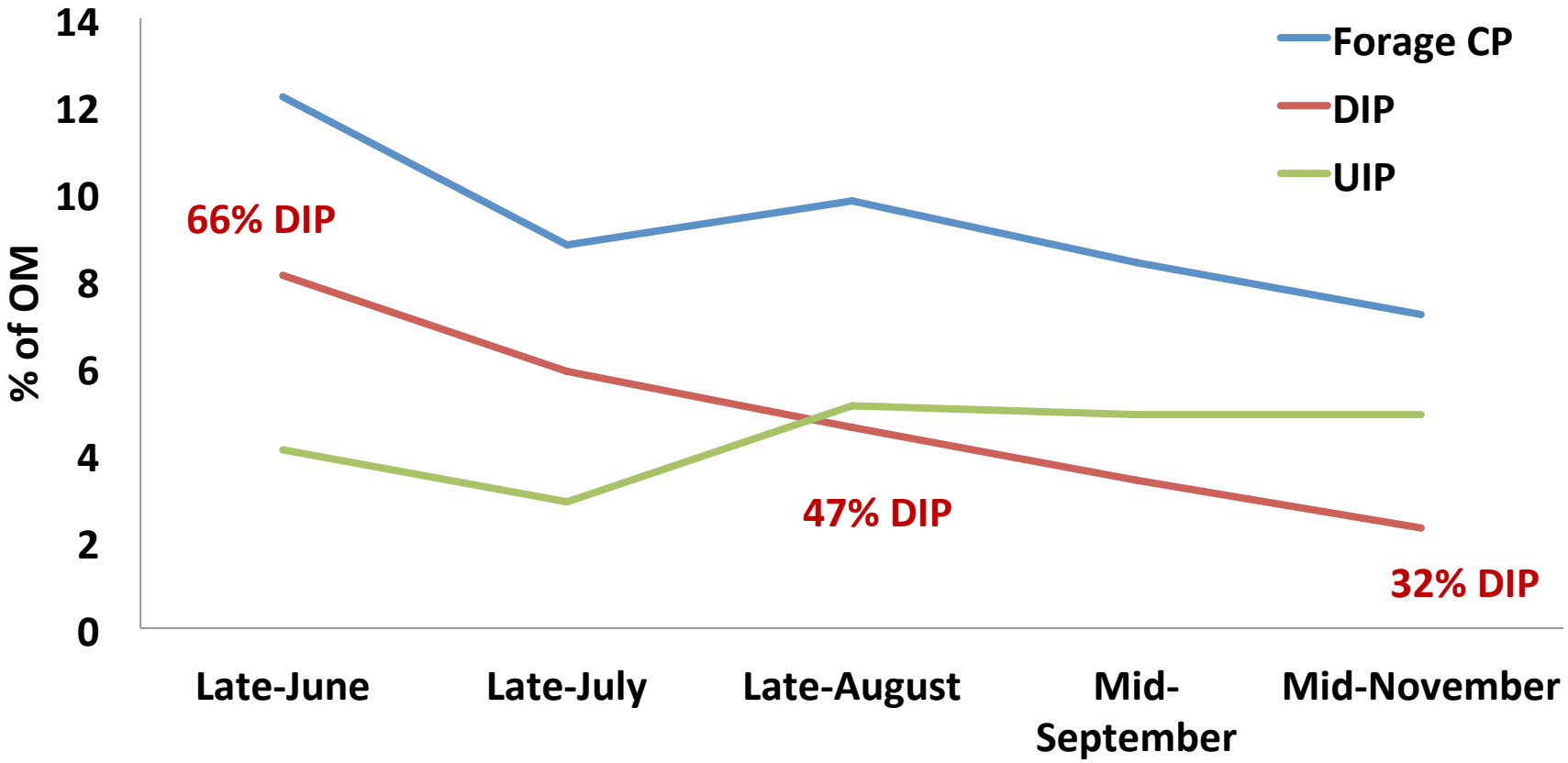
Protein Overview



Metabolizable Protein

- **Protein that is available to be utilized by the animal**
  - **Combination of UIP and digestible microbial protein**
  - **Microbes passing out of the rumen are 80% protein, 80% digestible**
    - **64% digestible protein**
  - **Microbial protein can provide nearly all of animals' protein requirement**
  - **In times of limited CP and/or limited energy intake, microbial protein alone may not be enough**

Seasonal changes in CP and DIP



Cline et al., 2009. Western North Dakota native mixed-grass range

Effects on Microbial Protein Production

	Grazing Period				
Item	**Late-June**	**Late-July**	**Late-August**	**Mid-September**	**Mid-November**
CP intake, g/d	**1,110**	**764**	**586**	**499**	**310**
DIP intake, g/d	**736**	**508**	**303**	**210**	**100**
UIP intake, g/d	**374**	**256**	**283**	**282**	**216**
Microbial CP supply, g/d	**470**	**470**	**347**	**327**	**258**

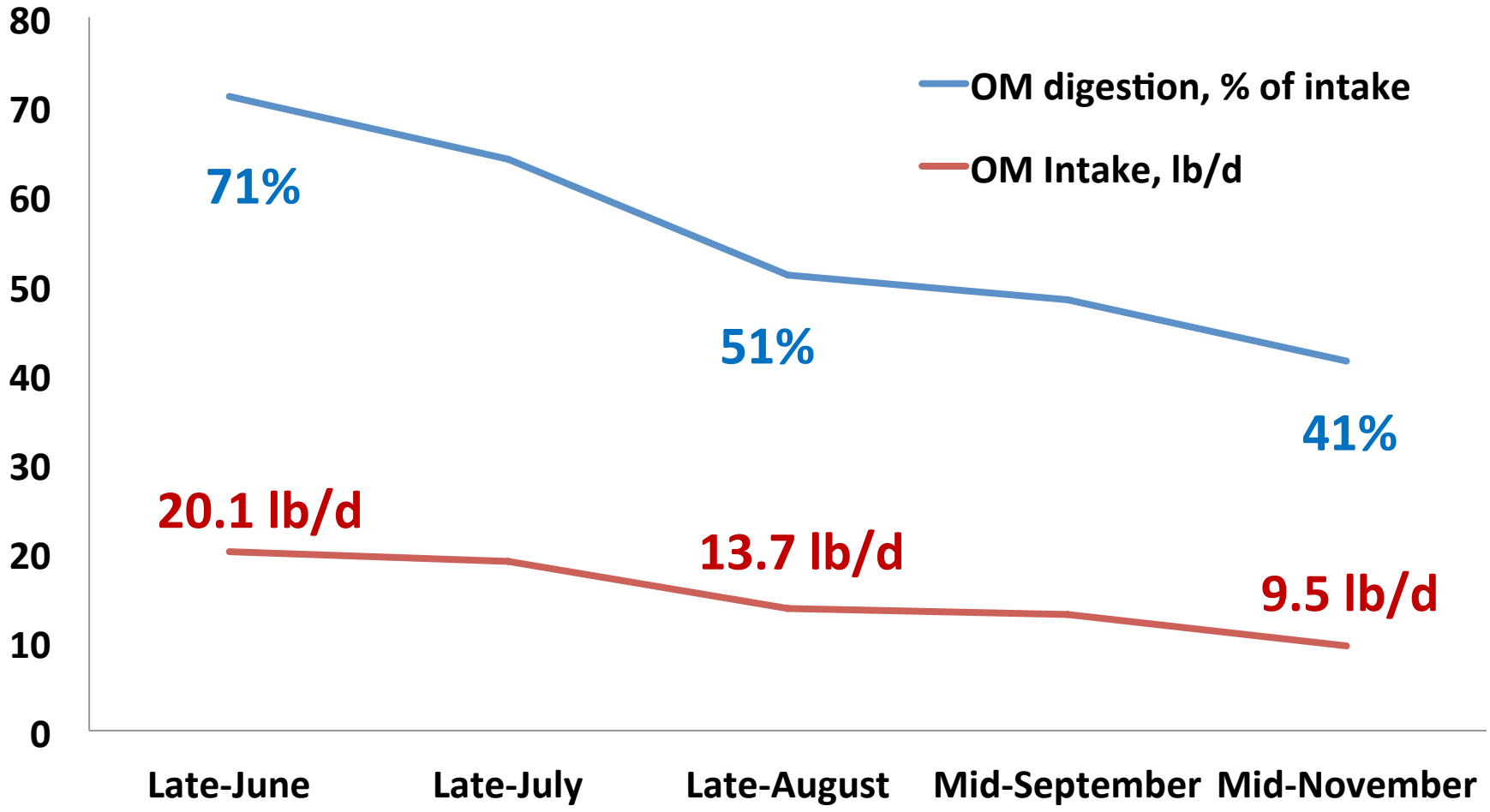
Cline et al., 2009. Steers grazing Western North Dakota native mixed-grass range

Another factor: Effect of DIP on forage intake

- **As grazing season progresses, forage quality decreases**
  - **CP as well as organic matter digestibility**

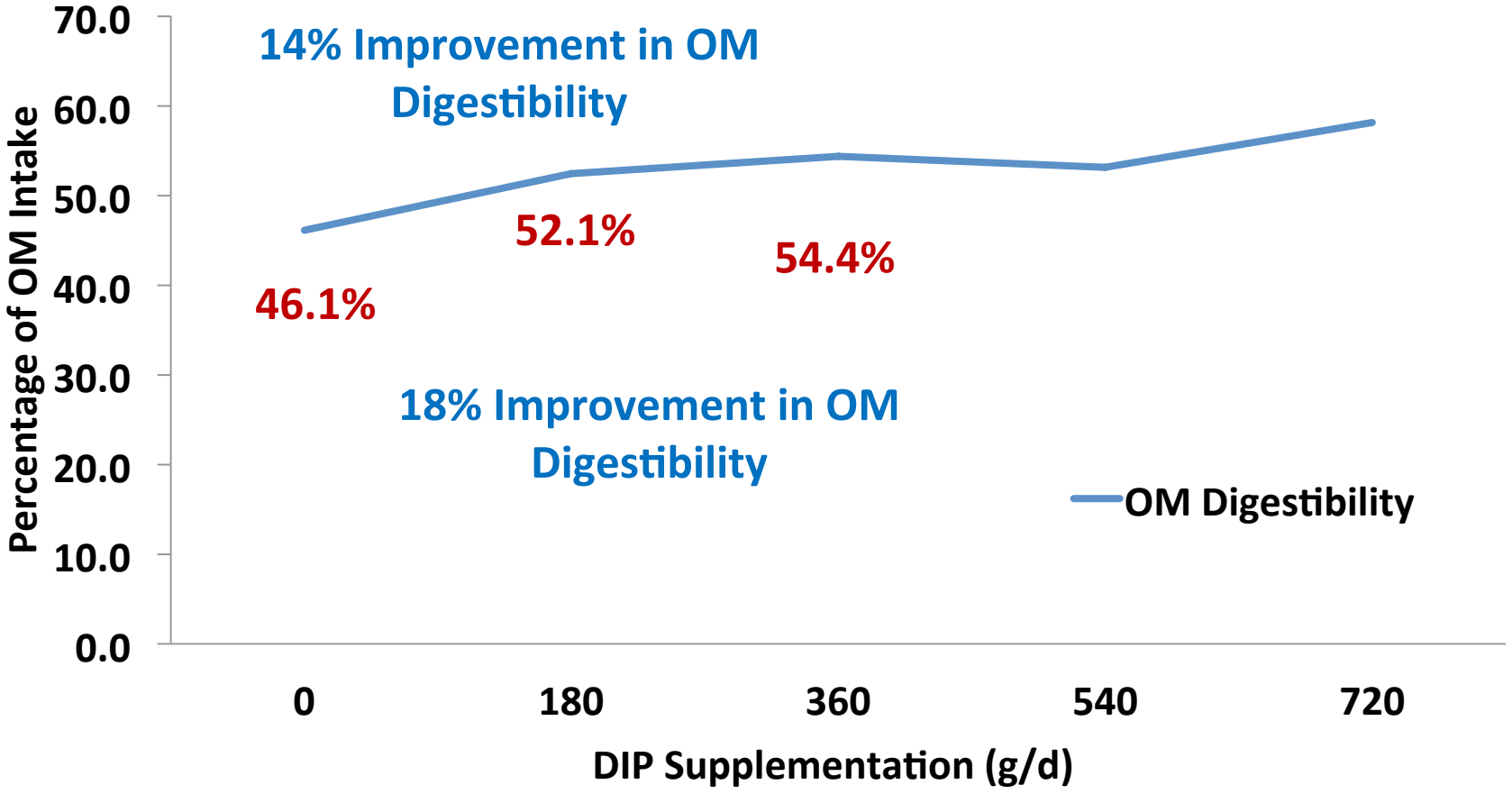
- **Decreased digestibility results in:**
  - **Increased rumen fill**
  - **Decreased rumen turnover**
  - **Decreased forage intake**

Seasonal changes in OM intake and digestion



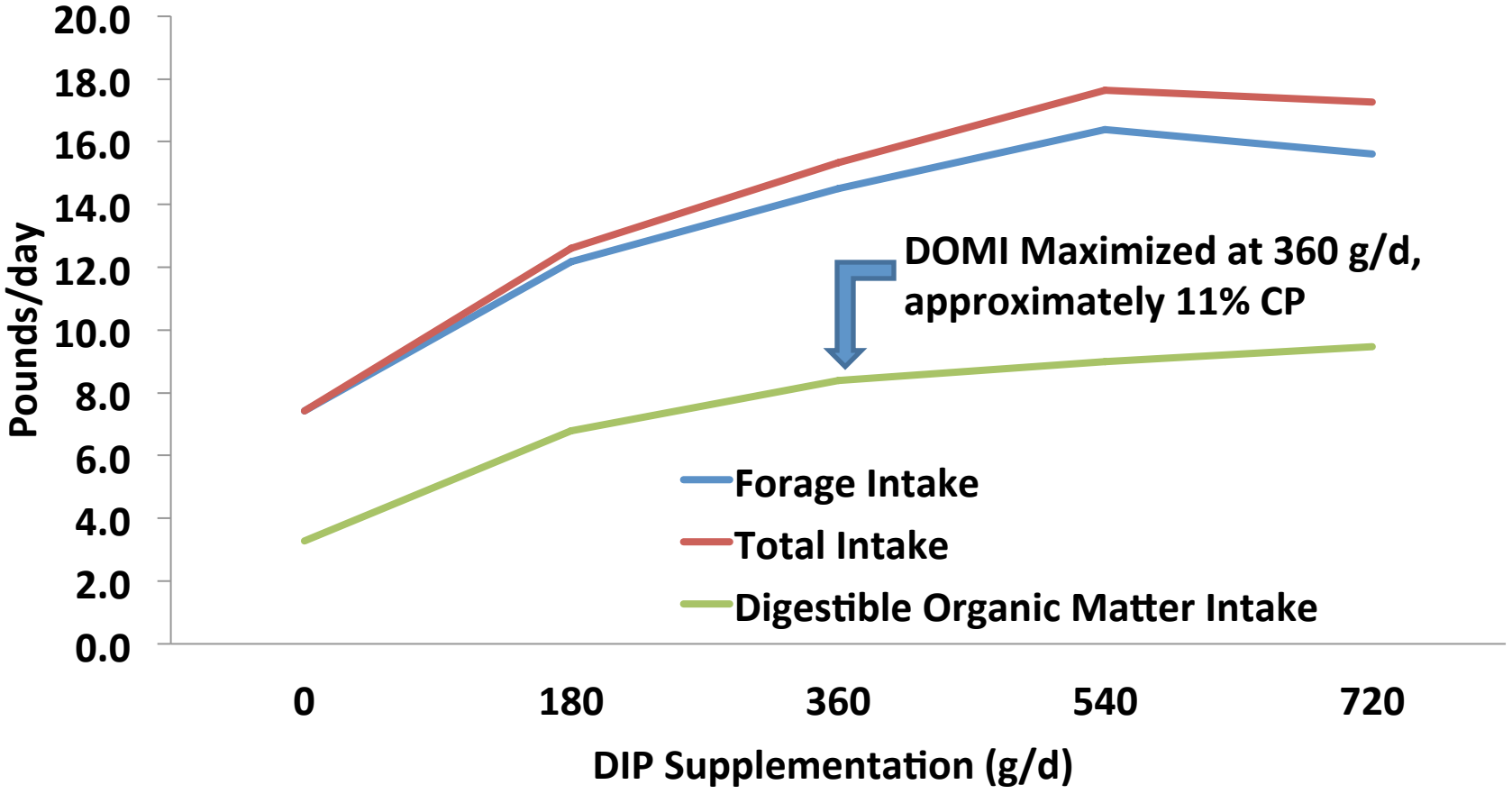
Cline et al., 2009. Steers grazing western North Dakota native mixed-grass range

Supplemental DIP Effects in Cows



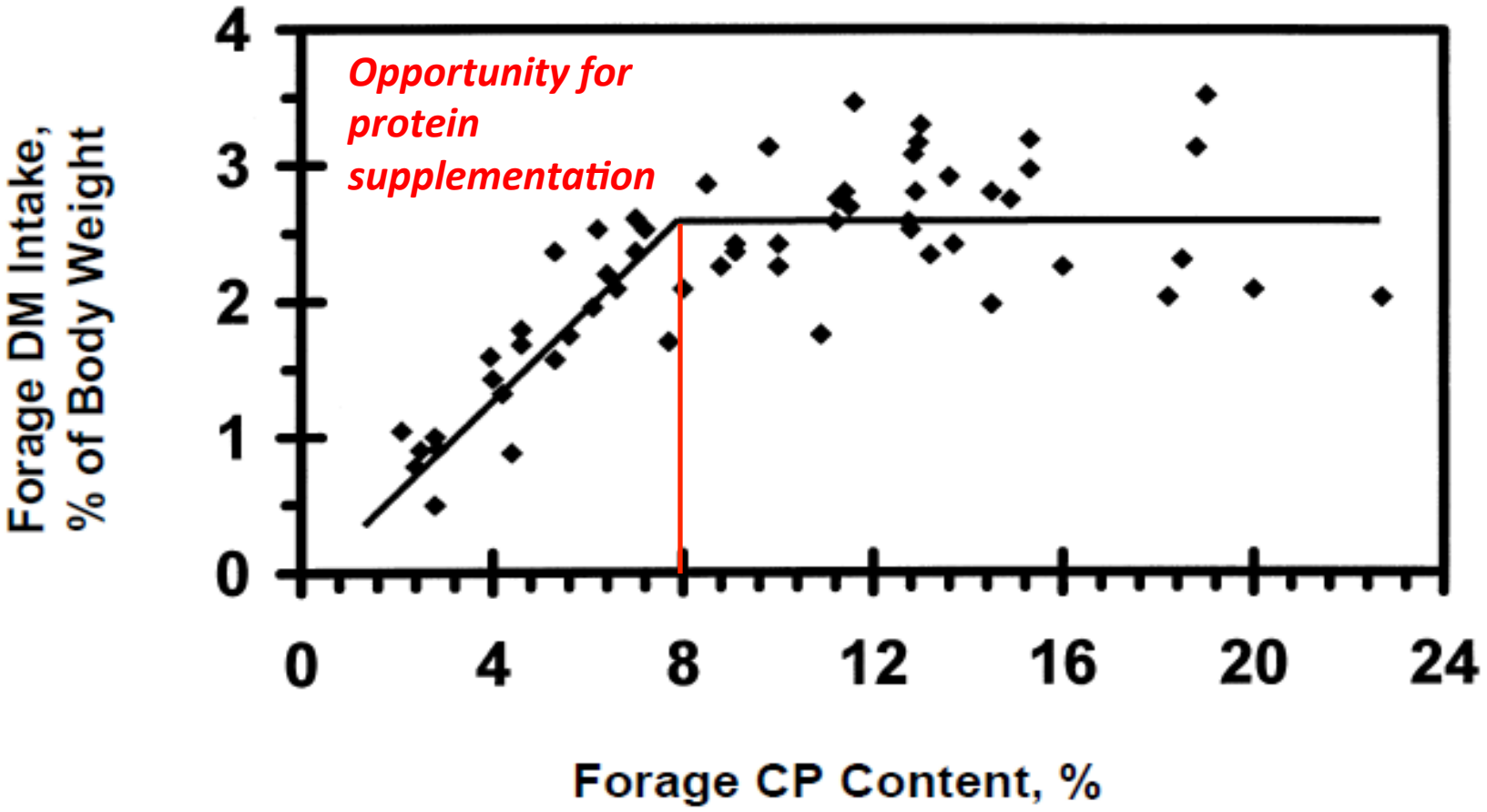
Koster et al., 1996. 1,168 lb non-lactating cows fed tallgrass prairie hay. Prairie hay contained 1.94% CP and 1.03% DIP.

Effect of Increasing DIP in Cows



Koster et al., 1996. 1,168 lb non-lactating cows fed tallgrass prairie hay. Prairie hay contained 1.94% CP and 1.03% DIP.

Correlation between forage intake and forage CP content



Adapted from Mathis, 2000

How much DIP is needed?

- **Koster et al., 1996: 11% of DOMI**
  - **Dietary digestible OM was approximately 46%**
  - **DIP of approximately 5% of DMI**
- **Hollingsworth-Jenkins et al., 1996: 6.7% of DOMI**
  - **Dietary digestible OM was approximately 56%**
  - **DIP of approximately 3.8% of DMI**
- **Lardy et al., 1997: 9.5% of DOMI**
  - **Dietary digestible OM was approximately 54%**
  - **DIP of approximately 5.1% of DMI**

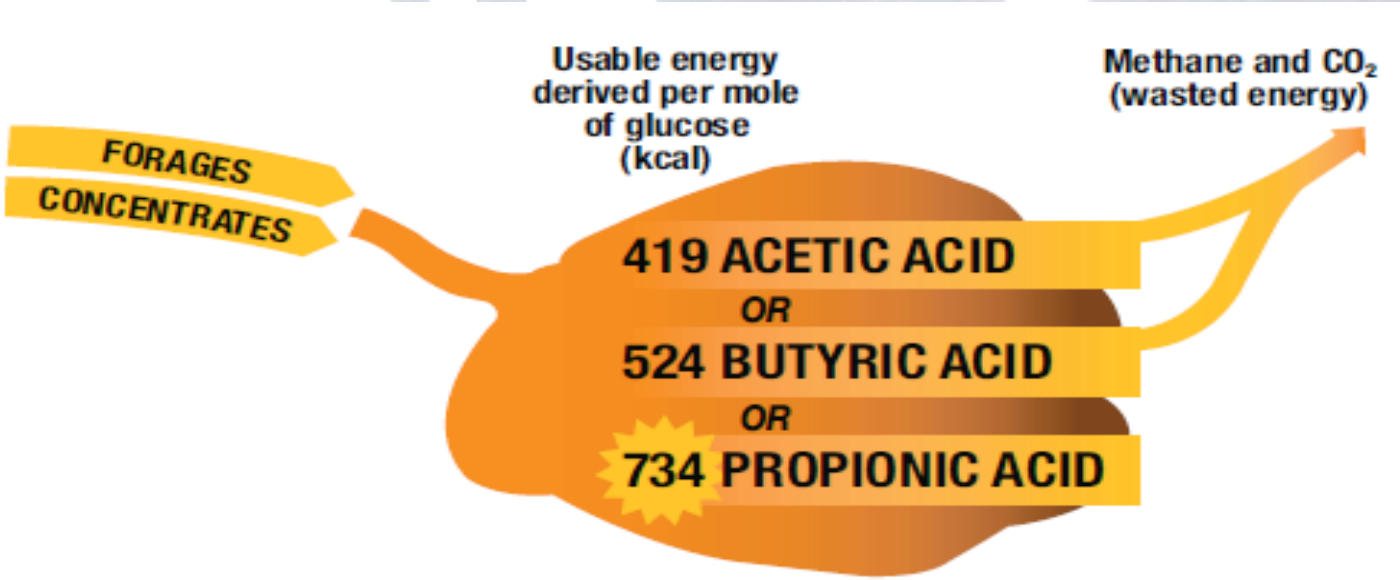
What will it take?

- **0.25 lbs of 60% CP mineral supplement will add 1.5 percentage units of CP to total DMI.**
  - **Forage CP intake = 6.5% of DM, supplement addition will lead to 8% CP in total diet**

- **0.5 lbs of 60% CP mineral supplement will add 3 percentage units of CP to total DMI.**
  - **Forage CP intake = 5% of DM, supplement addition will lead to 8% CP in total diet**

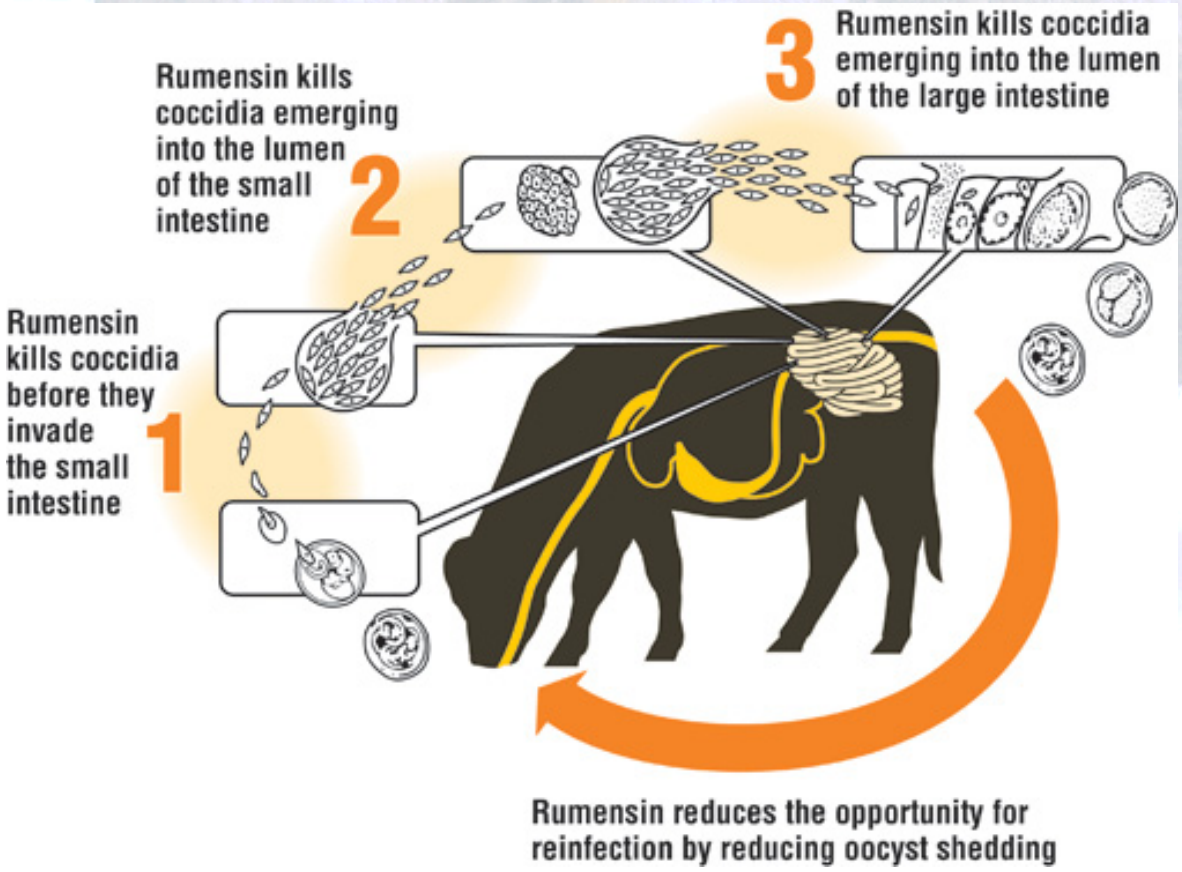
Ionophores for Beef Cows

- **What is an ionophore?**
  - **Selects for propionate-producing bacteria**
    - **Propionate will result in more efficient energy production**



Rumensin for Beef Cows

- **Coccidiostat**
  - **– Kills cocci at three difference life cycle stages**



www.elanco.com

Rumensin for Beef Cows

Four-trial dose titration, summary of cow weight change and feed intake data[1]

	Rumensin treatment*		
	0	50	200
Number of cows	108	99	109
Initial wt, lbs	1,063	1,050	1,049
Final cow wt, lbs	1,016	1,006	1,010
Wt change, lbs	-47	-44	-39
Feed intake (lbs DM/day/exp unit)			
Days 0–171	164.2[a]	155.7[b]	146.4[b]
Percent of control	100	94.8	89.2
Avg. days on study at calving	124	123	125
Days from calving to conception	93[c]	87[d]	87[d]
Number of cows bred	99	93	100
Number of cows conceived	90	86	97
Percent conception	90.9	92.5	97.0

[ab]Means within a row without a common superscript differ ($P < 0.01$).
[cd]Means within a row without a common superscript differ ($P < 0.05$).
*Rumensin feed at 0, 50 or 200 mg/hd/d of monensin.

11% Reduction in Feed Intake

Six fewer days to conception

Elanco Trial Data

Rumensin for Beef Cows

- **3-year North Dakota State University cow study**
  - **0 or 200 mg Rumensin fed 122 days prior to calving**
  - **Rumensin cows gained 0.2 lbs/day more (24 lbs total)**
  - **Rumensin cows also consumed 7% less hay (2 lbs/day)**
  - **No effect on calf birth weight, adjusted weaning weight, etc.**

Landblom and Nelson, 1981

Rumensin for Replacement Heifers

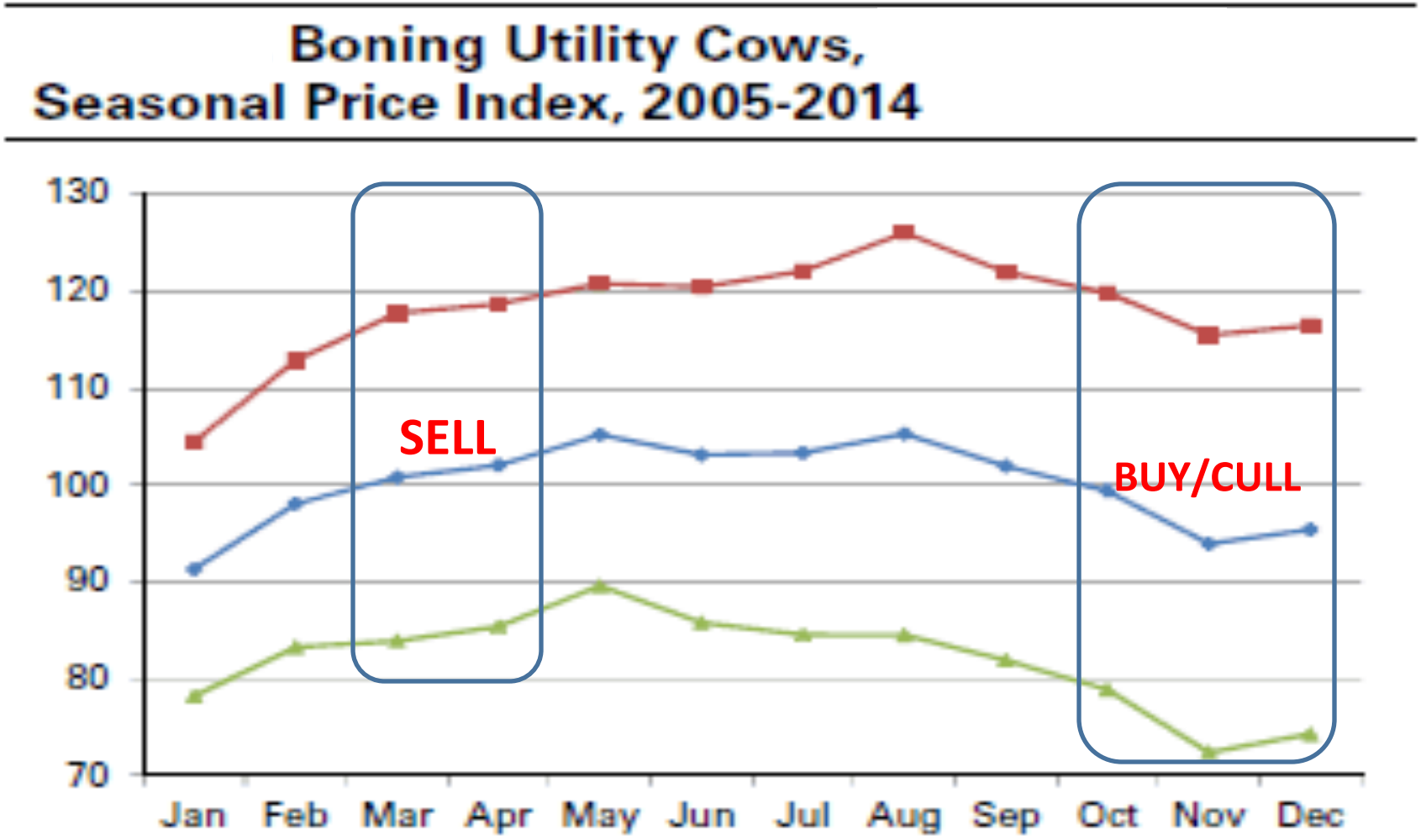
Performance in heifers[6]

Rumensin treatment*	Avg. day of trial at first estrus	ADG, lbs	Improvement, lbs/hd/d (%)
0	152[a]	1.43[a]	—
150	139[b]	1.57[b]	0.14 (9.8%)

[ab]Means within a column without a common superscript differ ($P < 0.001$).
*Rumensin fed at 0 or 150 mg/hd/day of monensin.

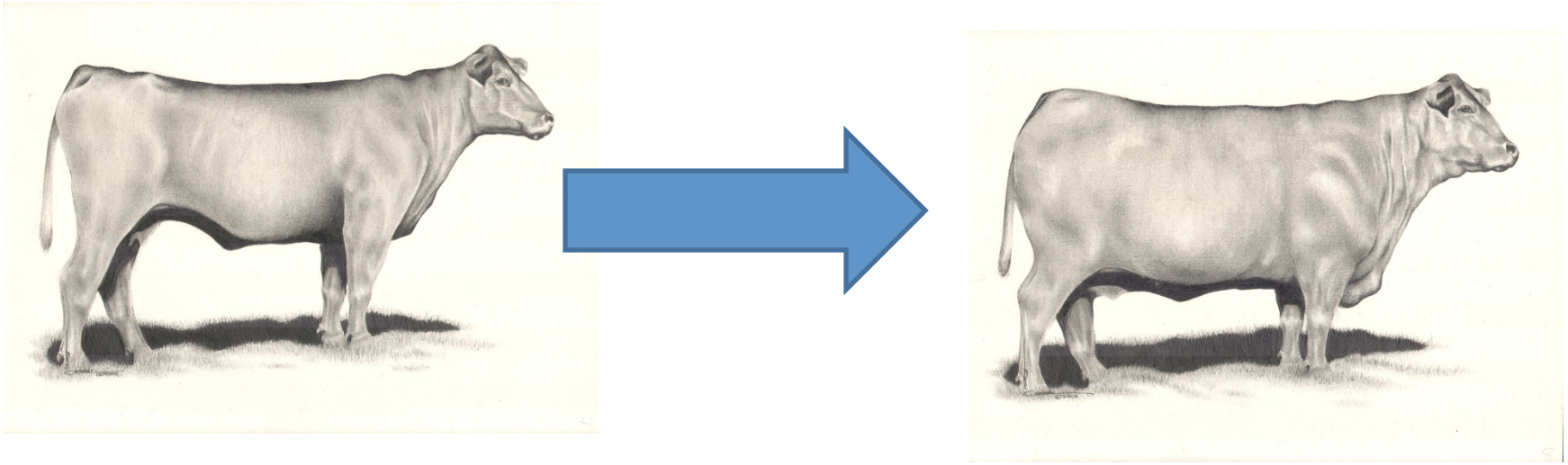
Ten-Trial Summary, Elanco Animal Health Data; Sprott et al., 1988 J. Anim Sci.

Maximizing Cull Cow Value



Iowa State University Ag Decision Maker

Maximizing Cull Cow Value



Commercial grading cows are worth, on average, 15% more than boning utility cows

Feed adaptation and intake

- **Remember, cull cows are adapted to grass and need to be acclimated to grain**
- **Due to large rumen, GI tract, liver, etc., intakes will be extremely high**
  - **2-2.5% of BW**
- **Focus on TOTAL energy intake rather than energy/unit of feed**

Notes on Cull Cow Feed Intake

- **Example:**
  - **Feedlot yearling steer consuming 28 lbs DM of 0.63 Mcal NEg/lb diet = 17.6 Mcal NEg/day**
  - **Feedlot cow consuming 35 lbs DM of 0.58 Mcal NEg/lb diet = 20.3 Mcal NEg/day**

Duration of Feeding and Implants

- **It takes at least 60 to possibly 110 days of concentrate feeding to turn yellow fat to white fat.**

- **Feeding cow implant research has shown positive response.**
  - **There are few studies comparing implants**
  - **Recommendation: Maximize performance with combination implant (200 mg TBA/20 mg estradiol)**

Take-Home Points

- **Current economics suggest a cow must have 6-7 calves to breakeven**
- **The third trimester is the most nutrient demanding trimester**
- **Early and mid-gestation nutrition is important for placental development and subsequent calf health**
- **Late-season grazing may be deficient in protein, and degradable protein may be required**
- **Cull cows can be an important profit center for cow/calf operations. Feed a moderate-energy diet for at least 100 days and use a performance-based implant**

Thank You

Grant Crawford, Ph. D.
605-251-3463
grant.crawford@merck.com