OPTIMIZING BEEF CATTLE NUTRITION FROM CONCEPTION TO CONSUMPTION

"Optimización de la nutrición de ganado de carne desde la concepción hasta el consumo".

IOWA STATE UNIVERSITY

CONFERENCIA INTERNACIONAL ENSMINGER PARA LA GANADERÍA

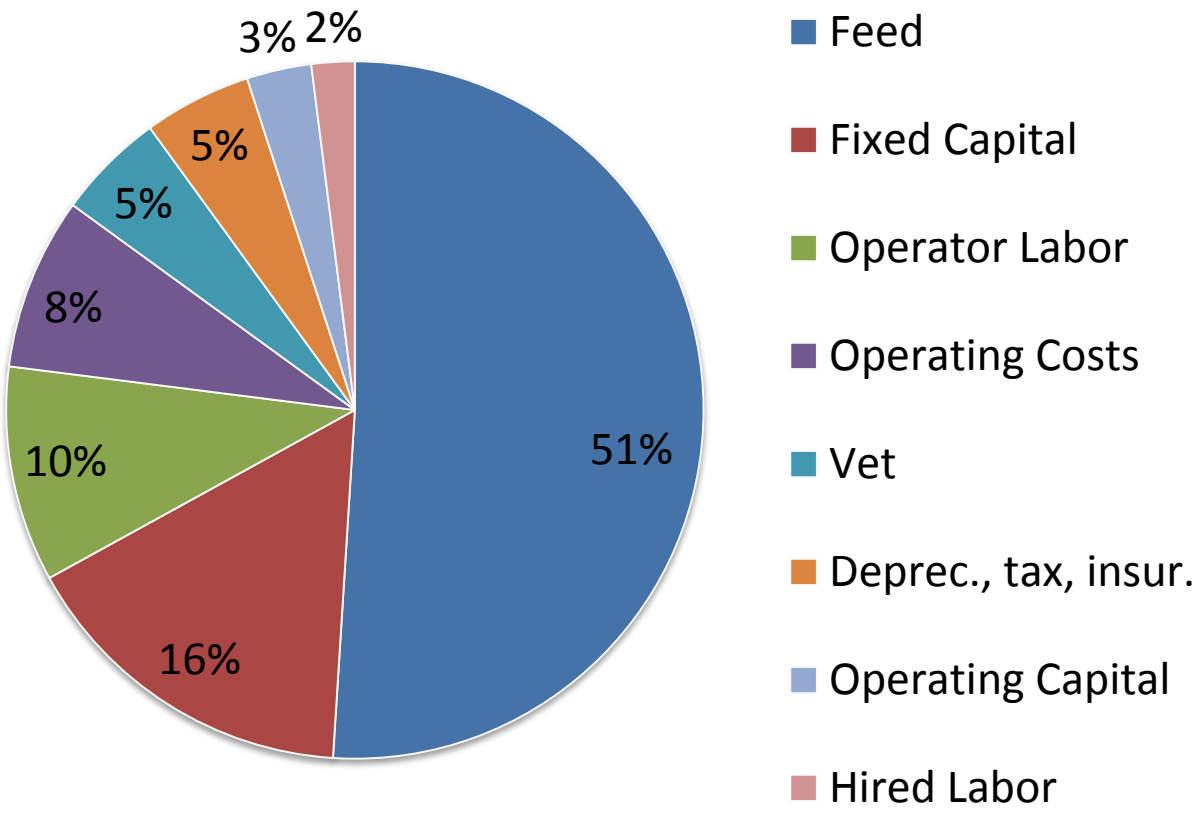
13 y 14 de mayo de 2016.

Patrick Gunn, MS, PhD, PAS

Cow-Calf Specialist

Iowa State University

Cost of Production



Beef cow efficiency

- **What about cow efficiency?**
  - **~70% of feed resources for cowherd**
  - **~70% of feed for maintenance**
  - **50% OF ALL FEED TO MAINTAIN COWHERD**

- **How do we define cow efficiency?**
  - **Pounds of calf weaned per cow exposed**
  - **Pounds of calf weaned per cow exposed per unit of feed energy consumed**

Nutrition & Reproduction

- Fertility #2 factor in determining profitability in cow-calf herd
  - Second to only feed costs
  - Open cows make you no money and cost you valuable resources to keep around

- Beef cows should be managed to optimize inputs
  - The better the nutrition, the more likely they are to reach their genetic potential
    - Cannot exceed genetic potential

Why reproductive efficiency is so critical?

- Estimated that reproductive failure costs the cattle industry (beef and dairy) $1 BILLION annually in the U.S. alone (Bellows et al., 2002).
- 1% improvement in reproductive performance will generate up to a 3 fold greater return on investment for cow/calf producers than a one percent improvement in production and/or product performance.
- 5x more important than product quality
- 5x more important than growth

lbs. of calf per cow exposed = $\frac{\text{total lbs. weaned}}{\text{\# females exposed}}$

- Indicator of reproductive performance, genetic selection, nutritional management
- Example 1:
  - Total lb. of calves at weaning = 28000 lb.
  - # of cows exposed to bull = 50
  - % weaned= 90% (45/50)
  - Average weaning wt. = 28000 / 45 = 622 lb.
  - lb. of calf per cow exposed= 28000 / 50 = 560 lb.

$$\textbf{lbs. of calf per cow exposed} = \frac{\text{total lbs. weaned}}{\text{\# females exposed}}$$

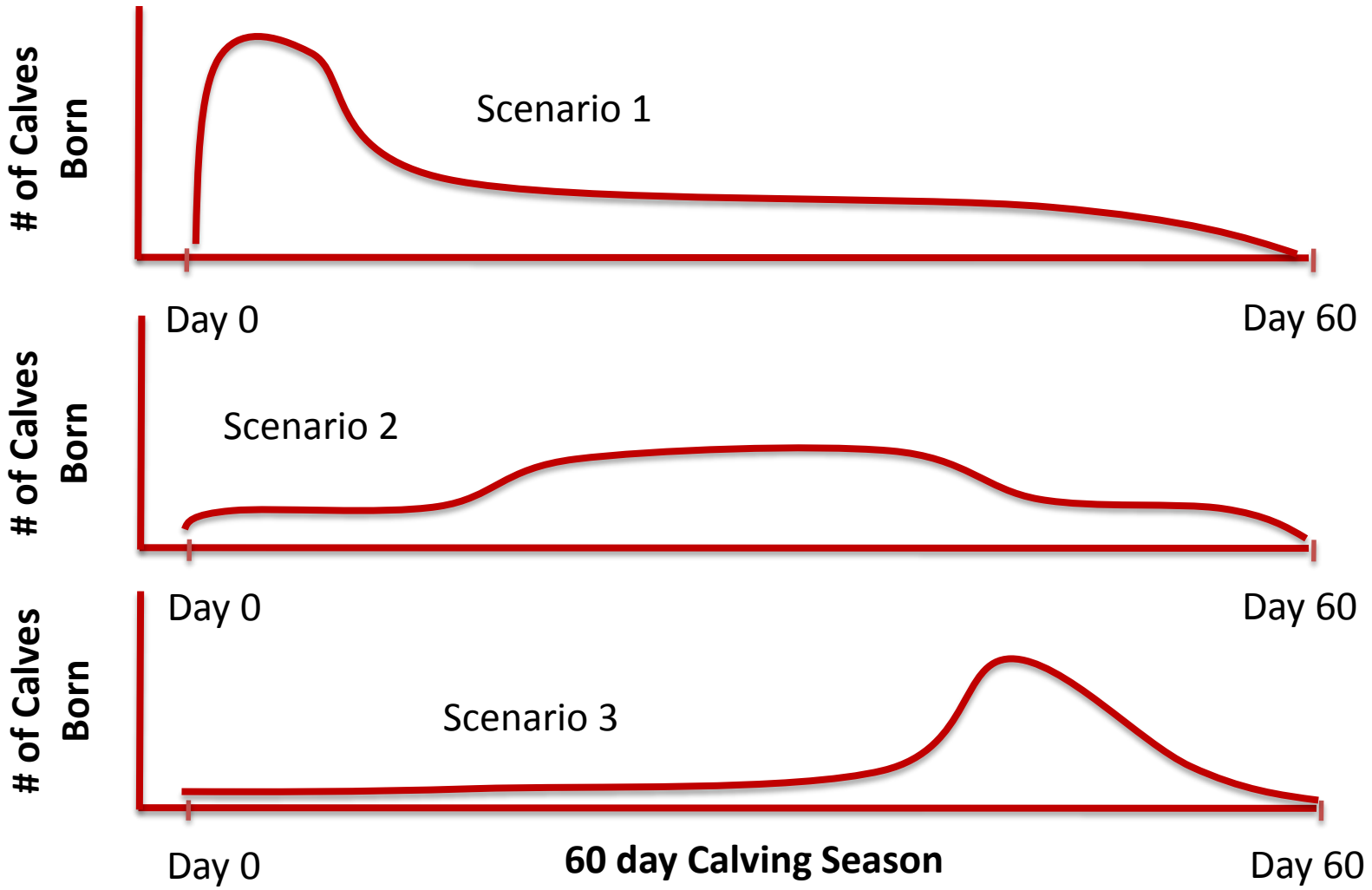
- Indicator of reproductive performance, genetic selection, nutritional management
- Example 2:
  - Total lb. of calves at weaning = 24880 lb.
  - # of cows exposed to bull = 50
  - % weaned= 80% (40/50)
  - Average weaning wt. = 24880 / 40 = 622 lb.
  - lb. of calf per cow exposed= 28000 / 50 = 498 lb.

Break-even prices at various levels of production and annual costs of production.

Calf Crop (%)	Weaning Weight (lb.)	Pounds of calf per cow	Annual costs per cow		
			$700	$800	$900
			Break-Even Cost		
90	550	495	$ 1.41	$ 1.61	$ 1.81
90	495	445.5	$ 1.57	$ 1.80	$ 2.02
90	440	396	$ 1.76	$ 2.02	$ 2.27
80	550	440	$ 1.59	$ 1.82	$ 2.05
80	495	396	$ 1,76	$ 2.02	$ 2.27
80	440	352	$ 1.99	$ 2.27	$ 2.56
70	550	385	$ 1.81	$ 2.08	$ 2.34
70	495	346.5	$ 2.02	$ 2.31	$ 2.59
70	440	308	$ 2.27	$ 2.60	$ 2.92

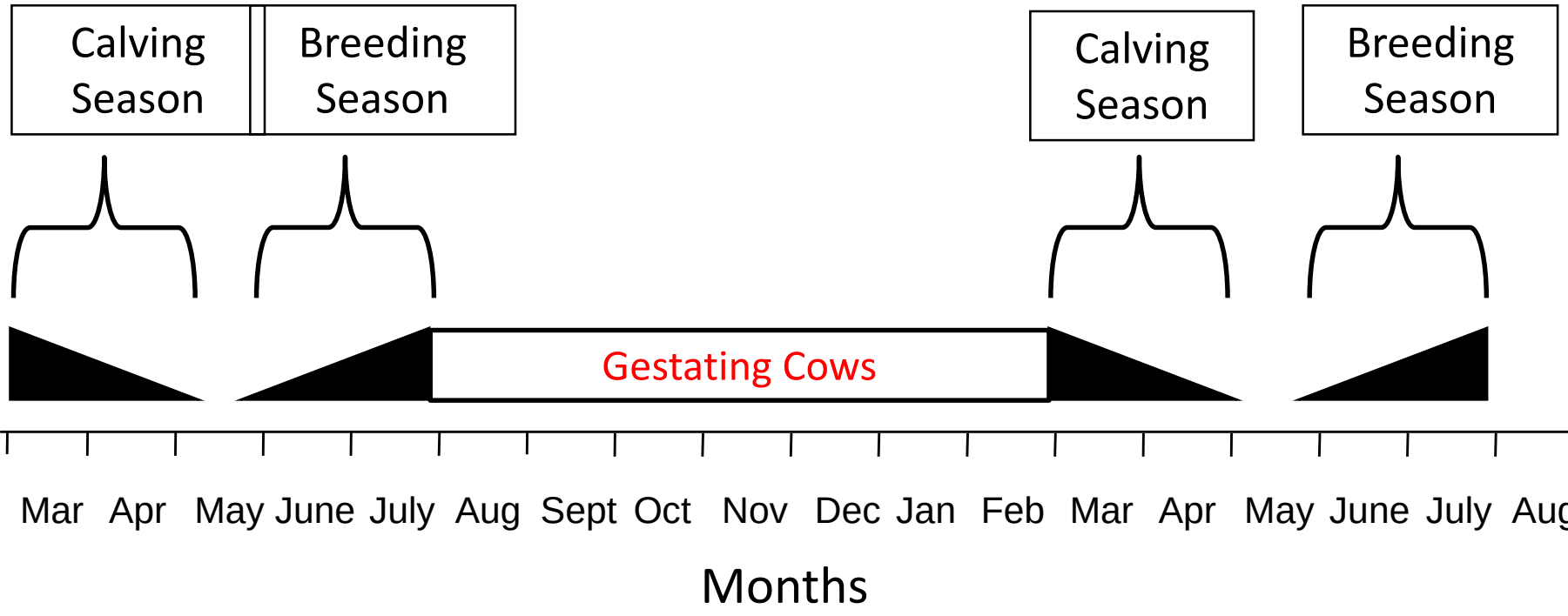
Adapted from Beverly and Sprott; Texas A & M

Calving Distribution



Yearly calving interval

*To have 1 calf every 365 d, have ~80 d for the cow to conceive after calving (365-285 = 80)
*Cows that calve late in the calving season, this will be a challenge

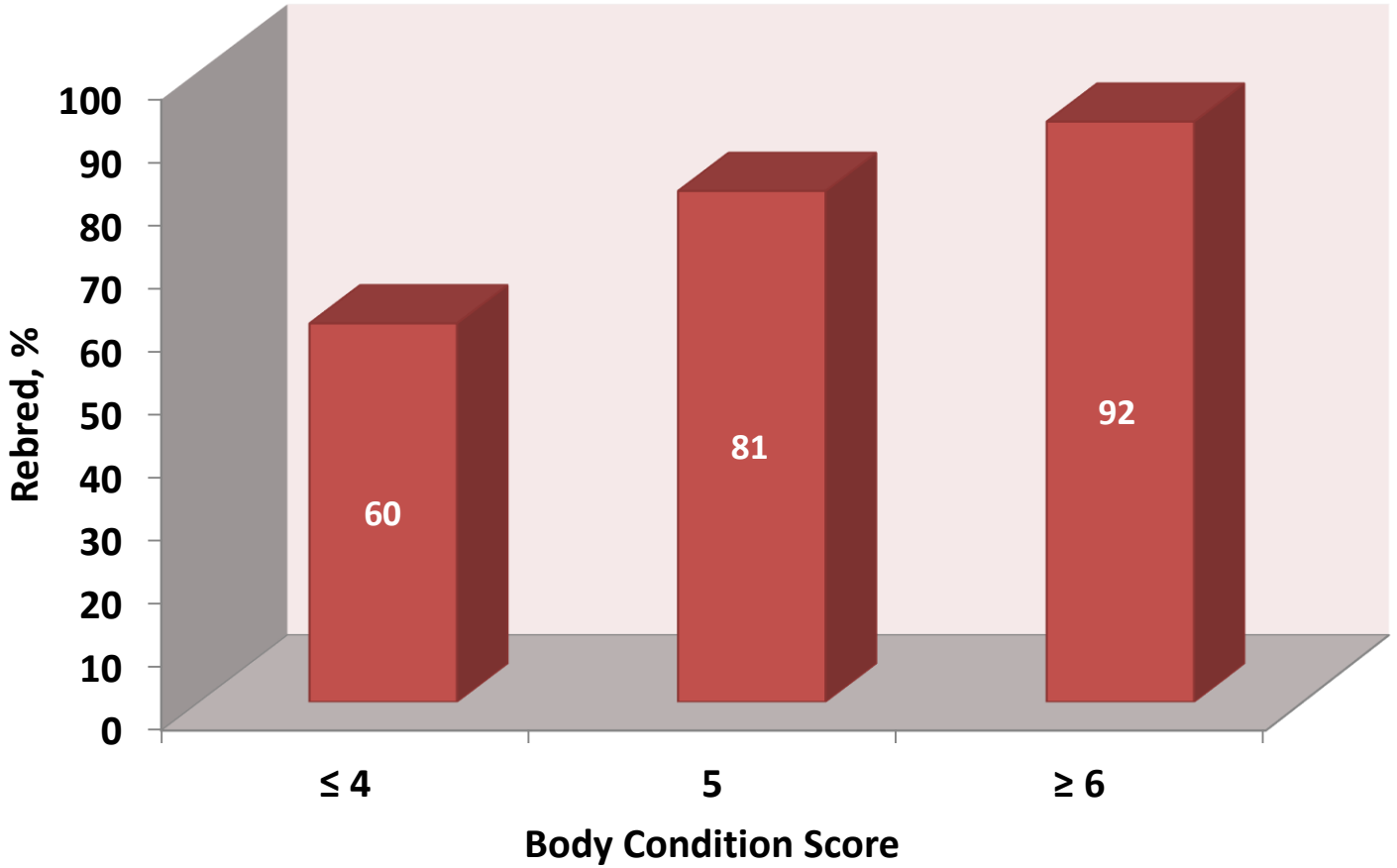


So what is the answer?

Body Condition Score (BCS)

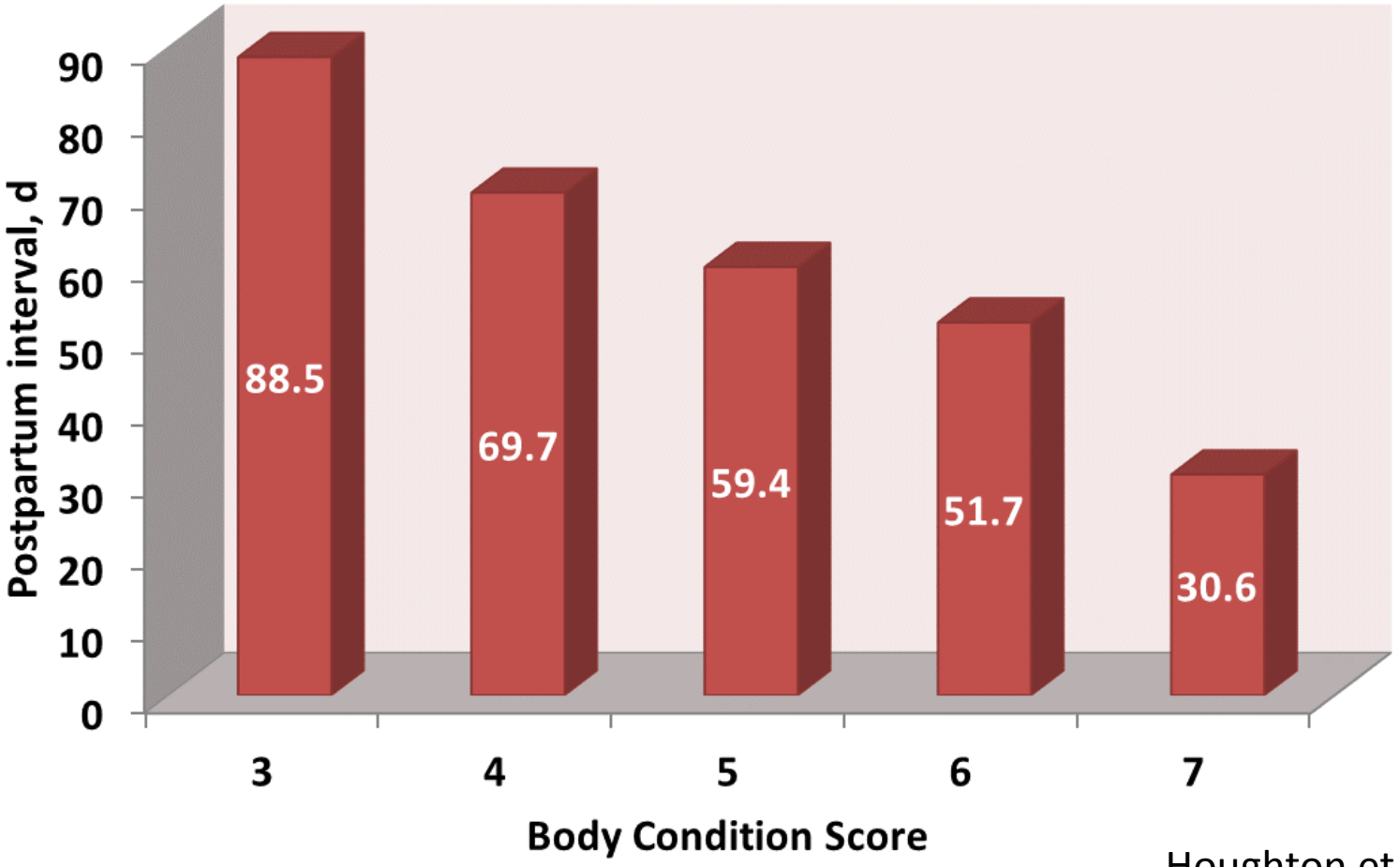
Photo Crystalyx.com

Pregnancy affected by BCS at calving



Percent of cows pregnant the subsequent breeding season according to BCS at calving. Adapted from Selk (ANSI-3283).

BCS and Postpartum interval



Houghton et al., 1988

When is nutrition (BCS) important?

- Pre-calving?
- Post-calving?
- Start of breeding season?
- During breeding season?

Nutrient partitioning

1. Basal metabolism
2. Activity
3. Growth
4. Energy reserves
5. Pregnancy
6. Lactation
7. Additional energy reserves
8. Estrous Cycles and initiation of pregnancy
9. Excess reserves

Short and Adams 1988

Things we forget in the beef industry

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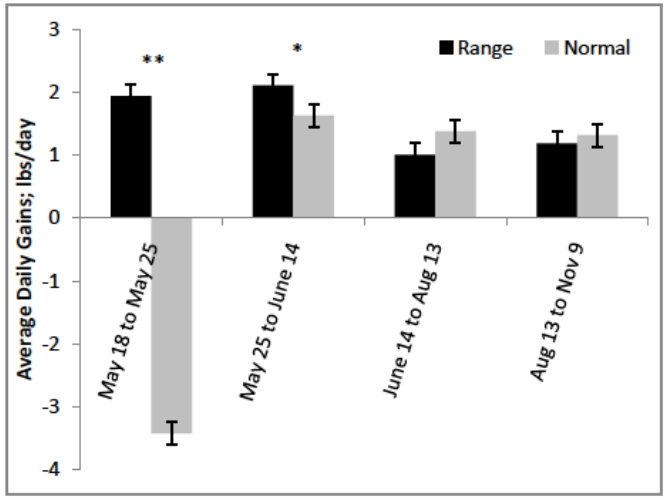
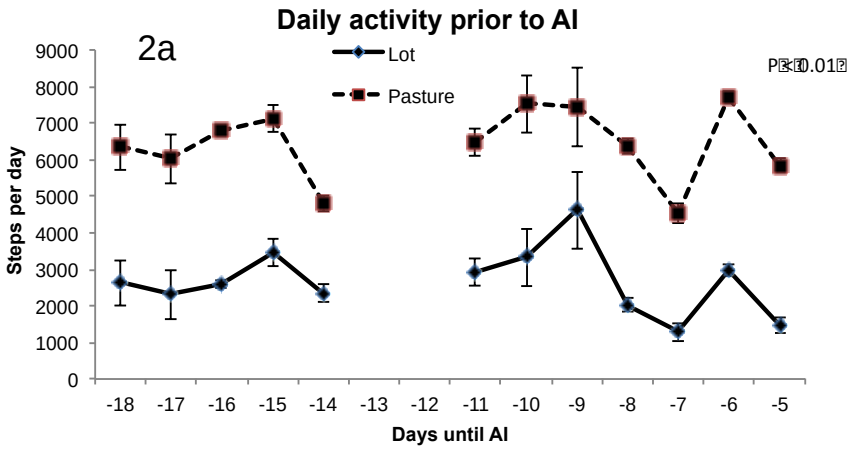


Figure 1. Average daily gain (lbs/day) of heifers weaned and developed on range (Range) compared to heifers weaned and developed in a drylot (Normal). All heifers were moved to the same pasture on May 18th (*$P = 0.06$; **$P < 0.05$)

Perry et al., 2009

Environment change and heifer activity



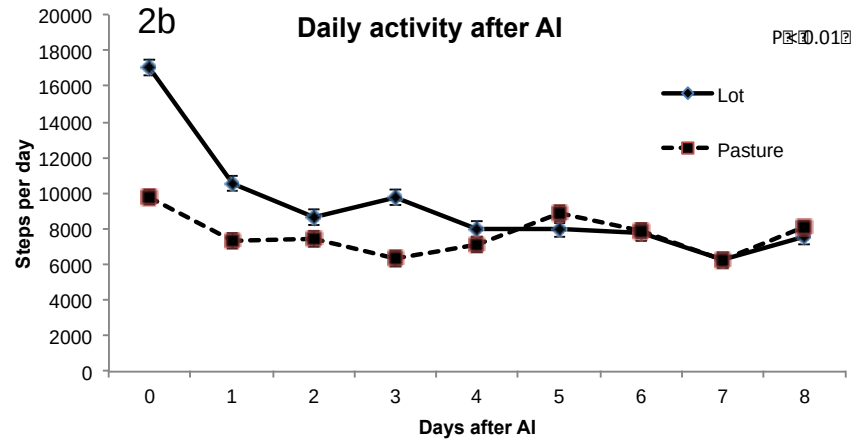
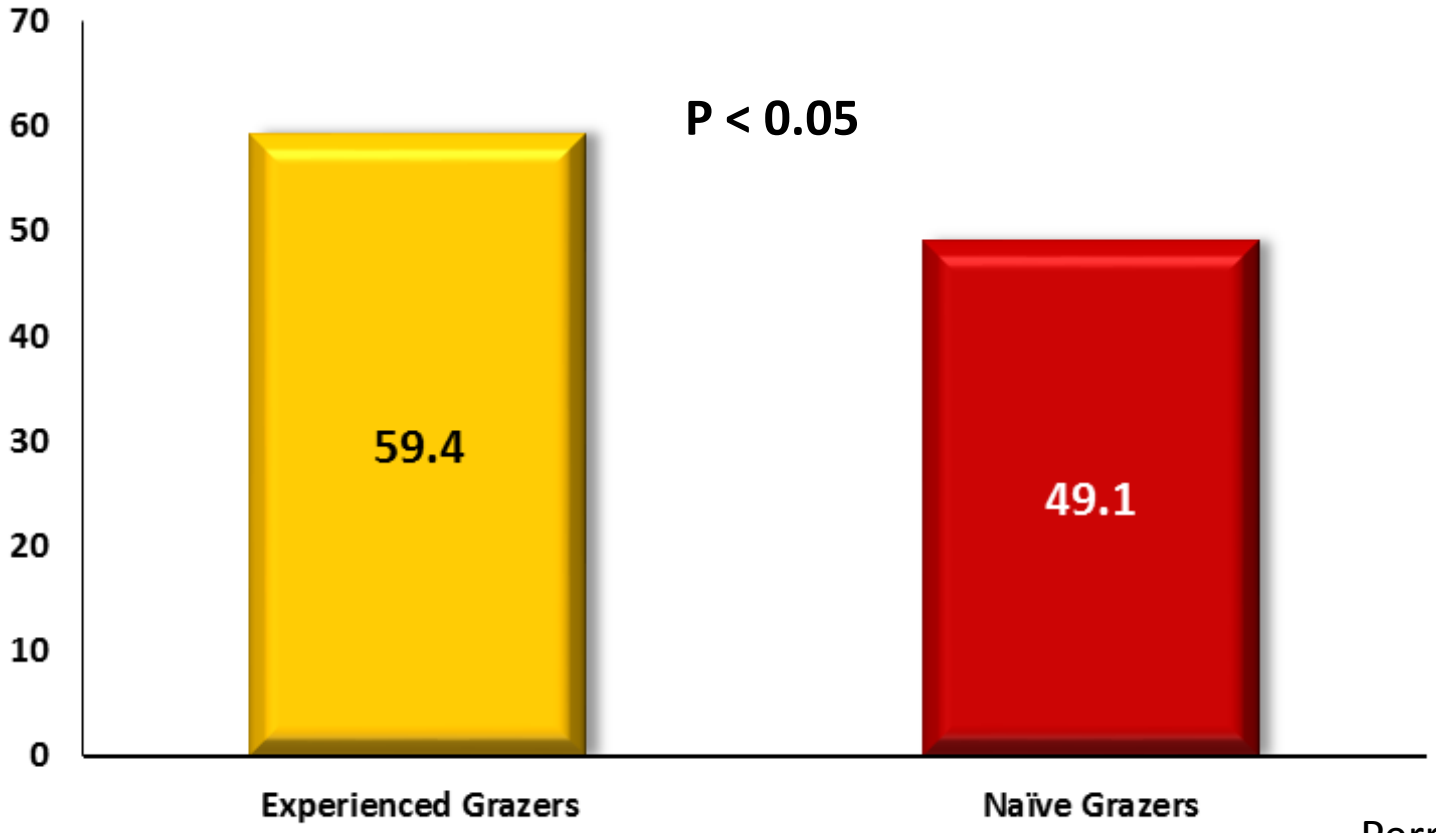


Figure 2. Daily activity for heifers developed in a dry-lot (Lot) and on pasture (Pasture) prior to AI (Figure 2a) and following AI (Figure 2b) when heifers were placed on a common pasture.

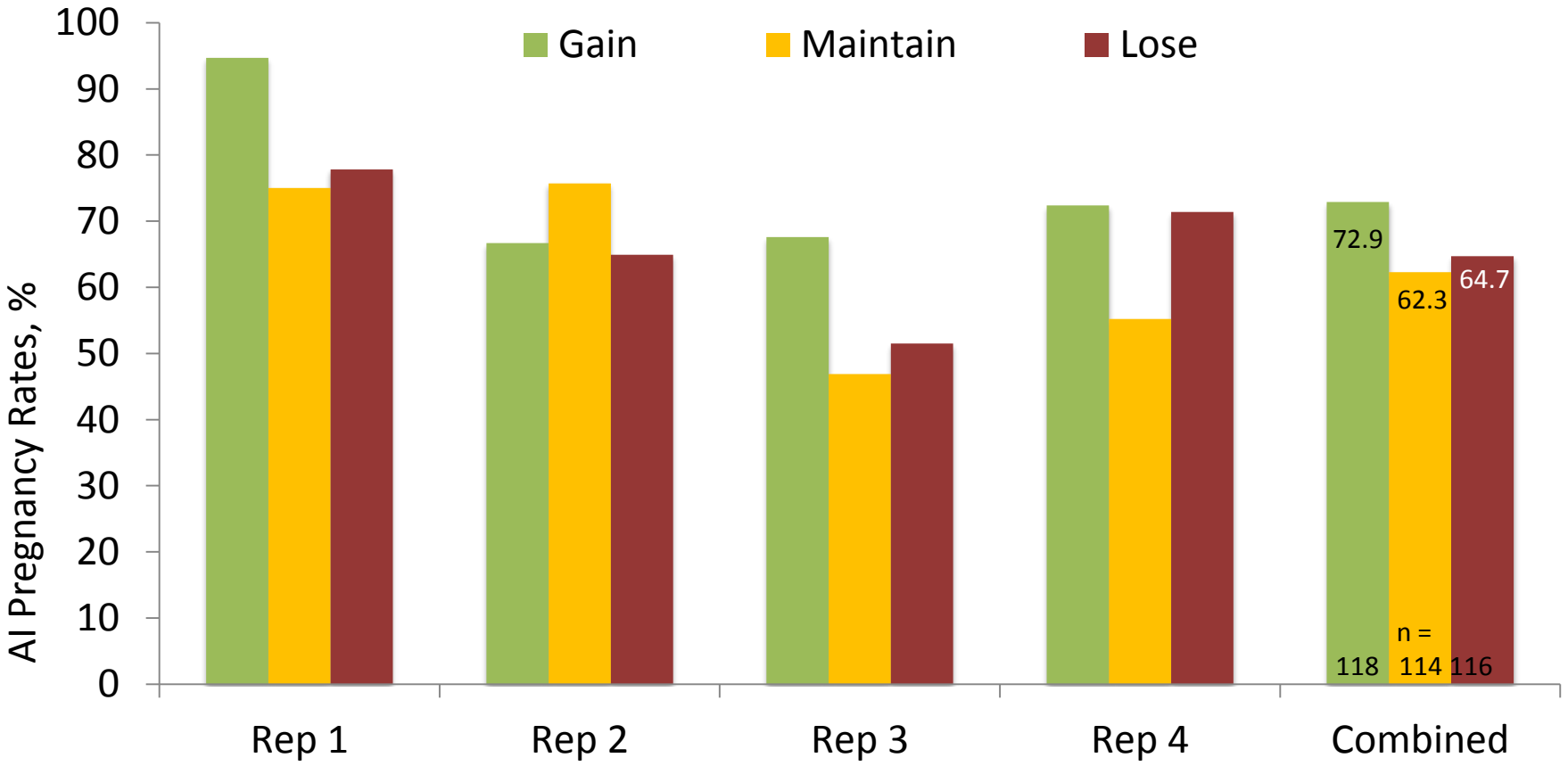
Perry et al., 2013

Dry-lot to pasture: impact on AI pregnancy rates



Perry et al., 2013

Effect of weight change first 21 d following AI

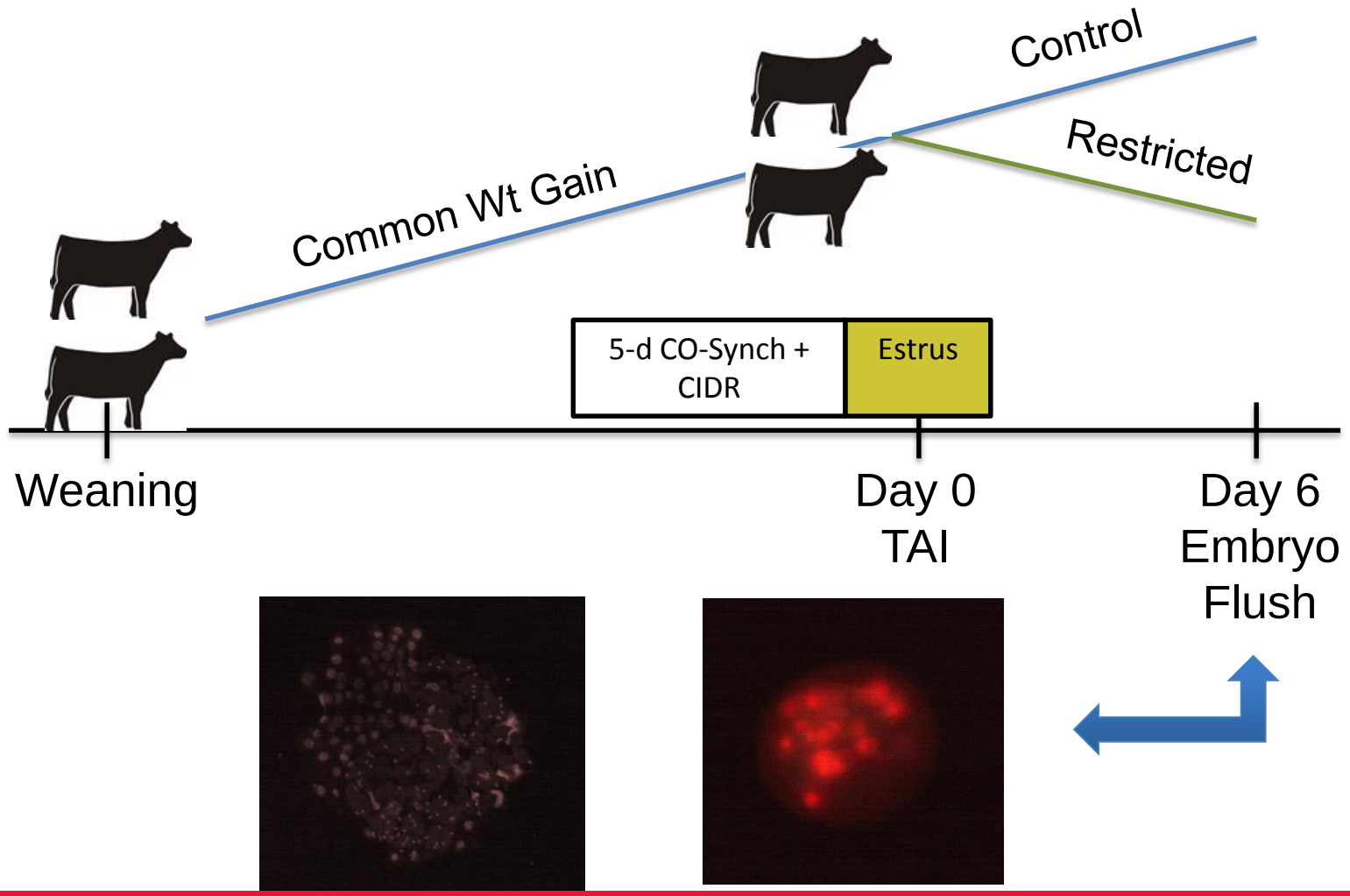


Contrasts:

- Gain vs Lose + Maintain – P = 0.04
- Maintain vs Lose – P = 0.69

Arias et al., 2012

Post breeding nutrition effect on embryo quality



Results

Effect of post-AI nutrition on day 6 embryo characteristics

TRT	n[a]	Embryo Recovery (%)	Embryo Stage (n[b])	Embryo Quality (n[c])	Dead Cells (n)	Total Cells (n)	Percent Live Cells (%)
CON	46	70.8 (46/65)	4.4 ± 0.16	2.2 ± 0.19	7.9 ± 1.04	66.9 ± 5.05	80.9 ± 4.19
RES	42	62.1 (42/66)	3.7 ± 0.16	2.9 ± 0.19	9.5 ± 1.11	47.9 ± 5.41	69.7 ± 4.39
P-value	.	.	< 0.005	< 0.05	ns	< 0.01	< 0.10

[a] Defined as embryo number; not heifer with the exception of recovery rate
[b] Stage of development (1-9;1 = UFO; 9 = expanded hatched blastocyst; per IETS Standards)
[c] Quality of embryo (1-5;1 = excellent; 5 = degenerate; per IETS Standards)

Kruse et al., 2013

Long term effects of cowherd nutrition

Developmental Programming

Developmental Programming

24 www.FarmProgress.com February 2015

Livestock

Momma matters

By MIRANDA REIMAN

Guest Column

RANCHERS don't plan to short-change their cows. Yet, the unexpected can leave a herd lacking.

"Typically, producers do not want to calve thin cows and do not like cows to lose weight during late pregnancy. We know that is bad," says Allison Meyer, University of Missouri animal scientist listing the side effects. "But a lot of times we end up in a bad situation late in gestation that results in cows losing weight or not getting as many nutrients as they need."

It could be drought, severe weather, poor forage quality or lack of hay stores, Meyer notes.

"That sets calves up for challenges both in the delivery and the hours afterward.

"If we don't have calves that are as big as they should be when they are born, that haven't developed as they should prenatally, then we're not going to get all of the genetic potential out of them that we

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Industry

Exploring fetal programming

November 10, 2014 | 8:10 am EST

We know the importance of colostrum at birth, good calf nutrition and sound weaning protocols in assuring calf health.

ning more, however, about how the cow's

s during gestation can affect the expression of

HOME > NUTRITION > CATTLE SUPPLEMENTS > FETAL PROGRAMMING STUDIES SHOW SUPPLEMENTATION PAYS

Fetal Programming Studies Show Supplementation Pays

Burt Rutherford

Feb 23, 2012

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Supplementing the cow during late pregnancy does a lot more than just keep the cow in good body condition.

More About: Calving Season

BOVINE VETERINARIAN

Week-in-Revie

Saturday, January 30, 2016

Trace minerals for pregnant cows

John Maday

During this week's Cattlemen's College session at the Cattle Industry Conventi Diego, Reinaldo Cooke, PhD, Oregon State University, outlined how trace min supplementation in gestating cows, perhaps above typically recommended leve benefit calf performance. Read More

56 www.FarmProgress.com – March 2014

LIVESTOCK

High-quality forage boosts fetus growth

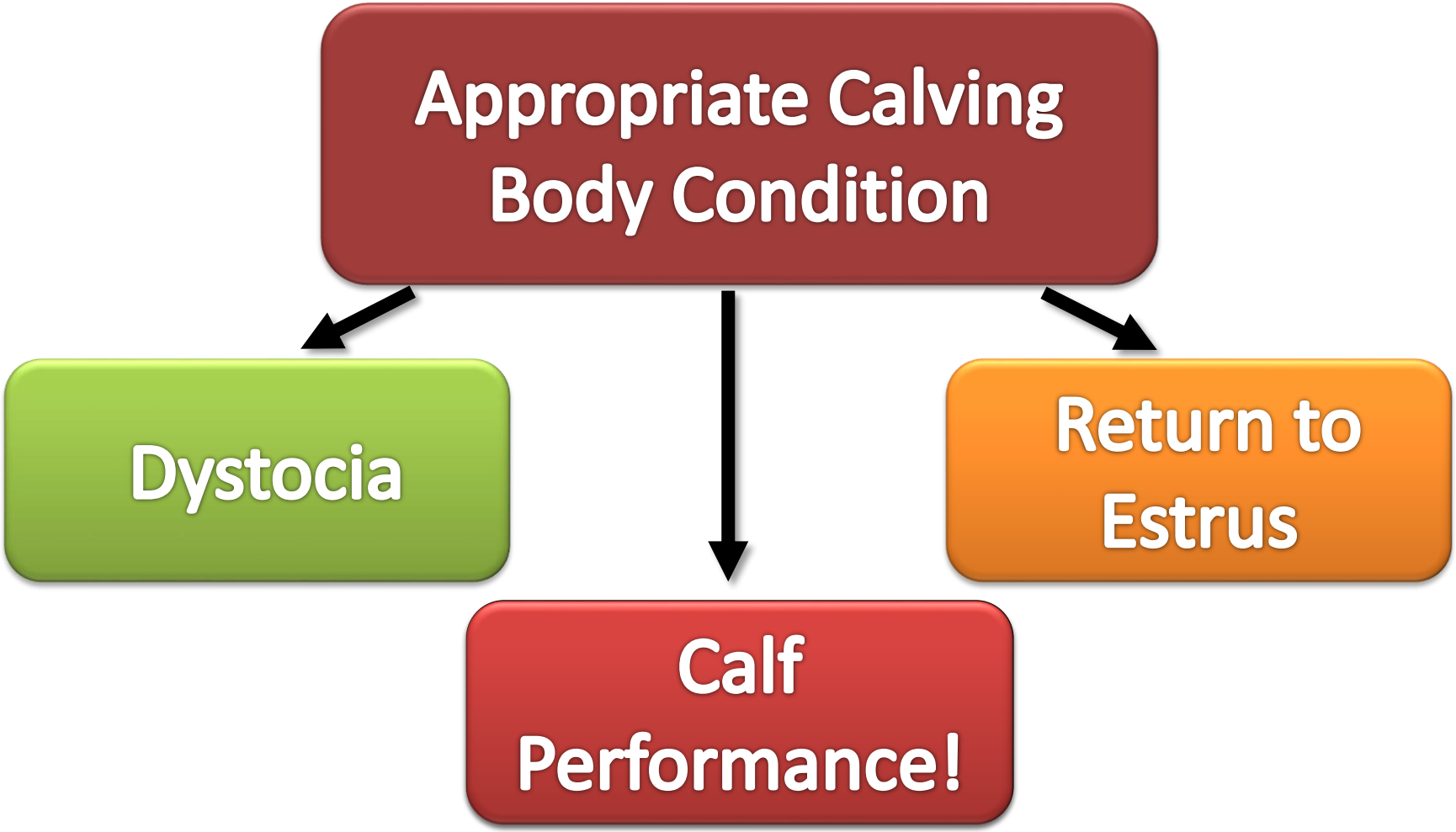
SKIMPING on cow nutrition causes long-lasting impact on a cow herd.

Dailey

includes guts and lungs, liver and heart, ovaries and testicles. Don't forget inter-

the become MU forage

Managing cow body condition



Phenotype

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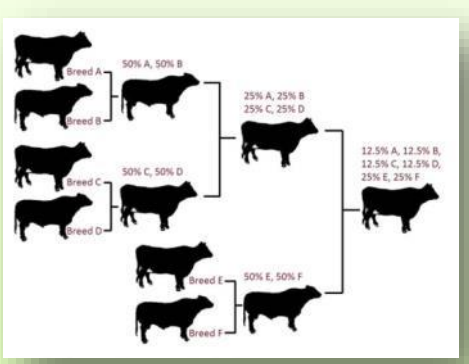
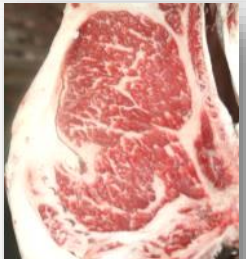


Genotype

+

Environment

http://futurebeef.com.au/topics/breeding-and-genetics/crossbreeding-systems-for-beef-cattle/



Phenotype

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Begins at mating

Genotype

+

Begins at mating

Or maybe earlier!

Environment

http://futurebeef.com.au/topics/breeding-and-genetics/crossbreeding-systems-for-beef-cattle/

Developmental Programming

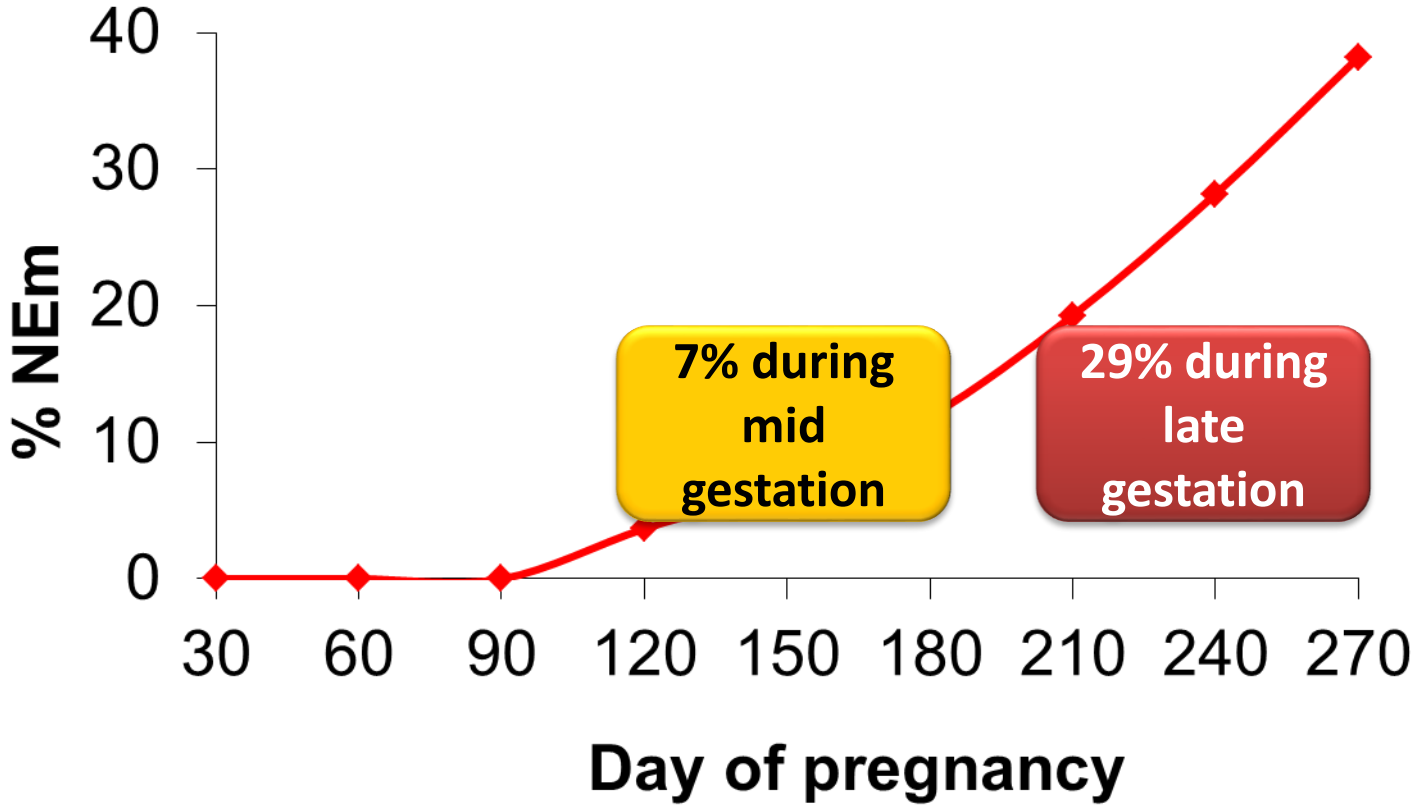
Maternal environment affects developing offspring

- Undernutrition likely results in impaired development and potential long-term consequences

Maternal environment

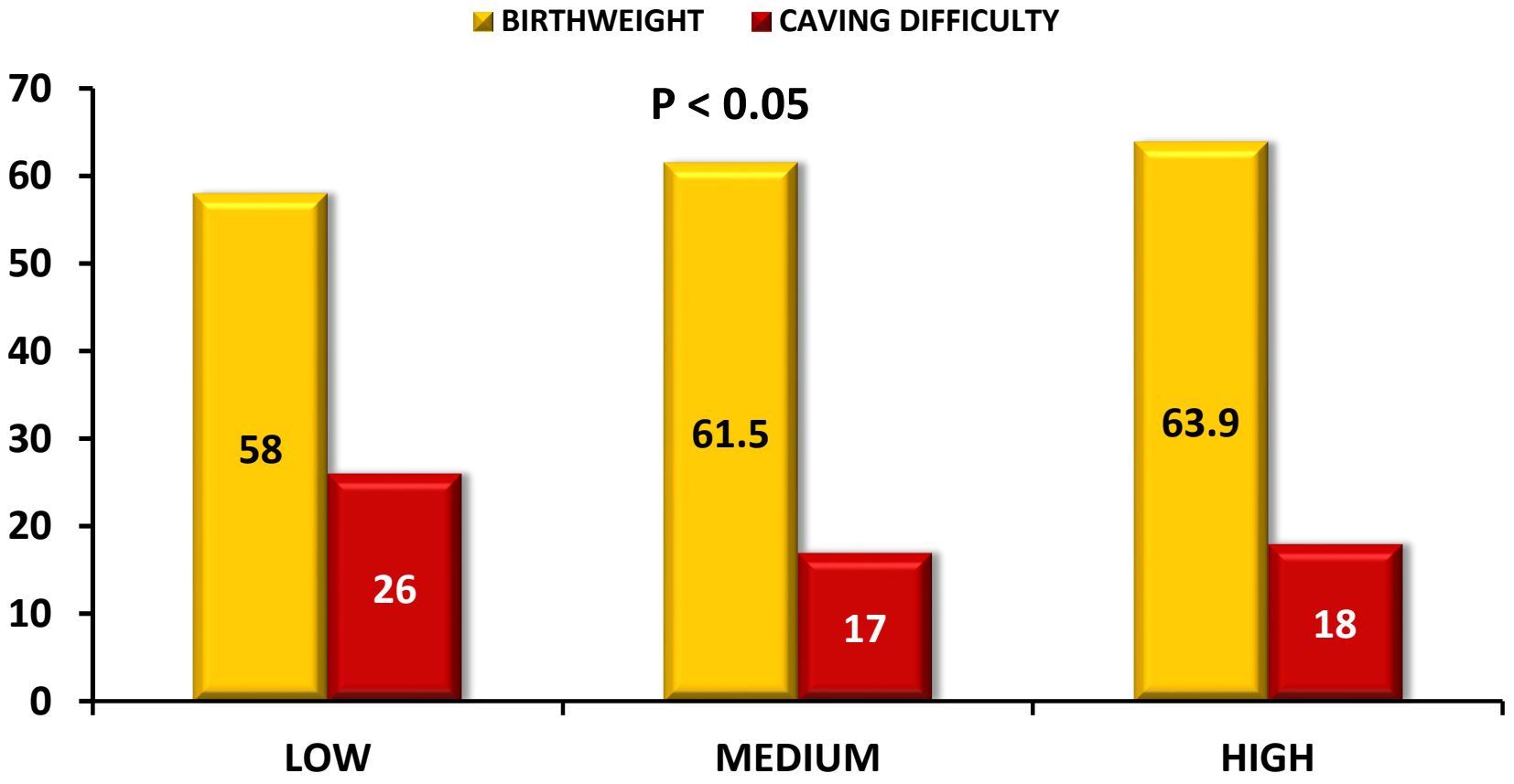
Offspring effects

Percent of Energy Requirements for Fetal Growth



NRC, 2000

Impact of pre-calving energy level on calving difficulty and birth weight



Adapted from Laster, 1974

Effect of Prepartum Energy Levels on Cow Productivity

	Continuous Low Energy	Low 70 days High Last 30 days
Wt. Change (lbs.)	- 142	- 22
Calf BW (lbs.)	59	67
Calf Survival (%)	71	100
Scours Treated (%)	52	33
Scours Deads (%)	19	0
Wean. Wt. (lbs.)	295	320

Corah et al, J Anim Sci - 1975

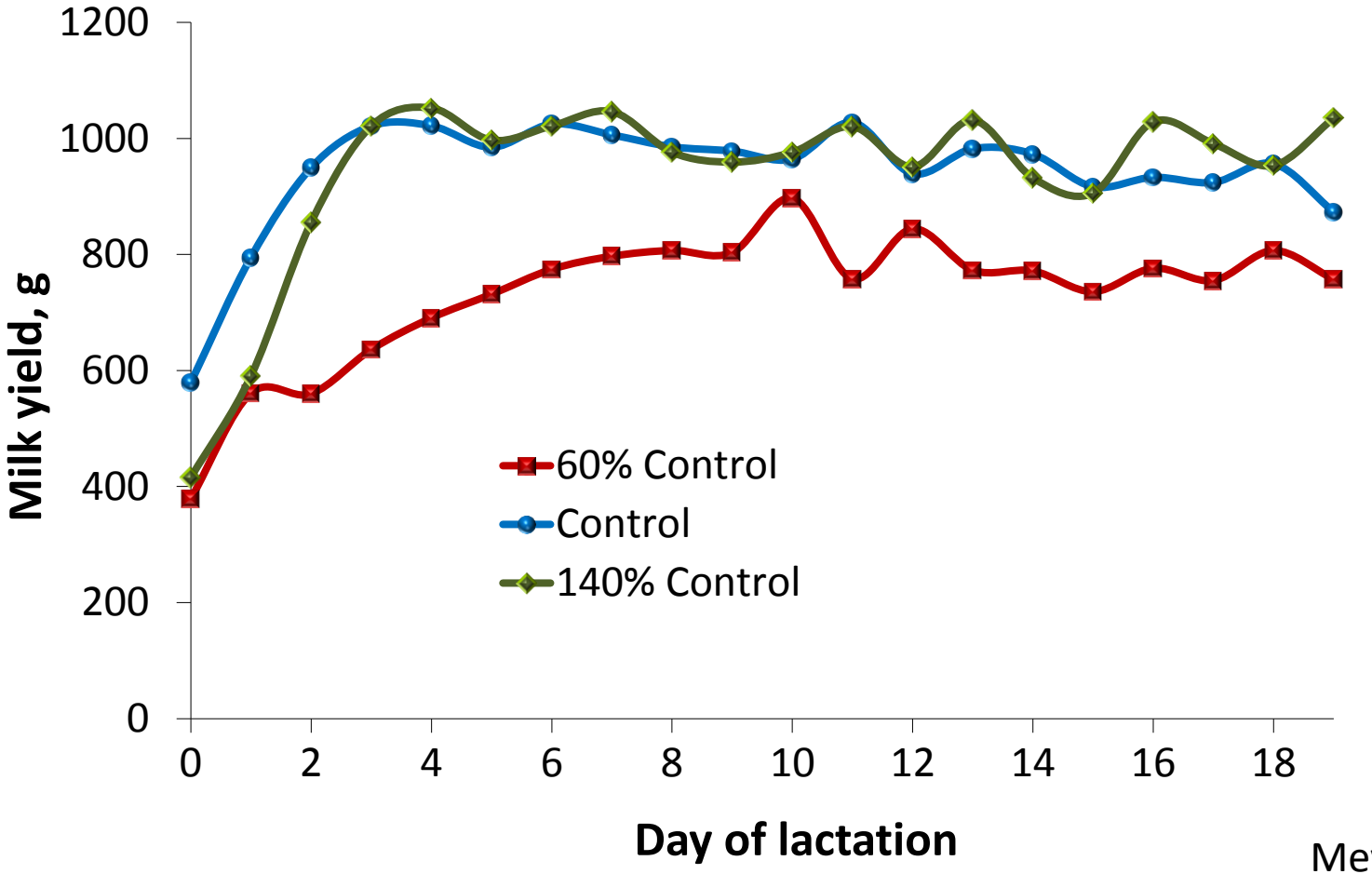
Heifer BCS and Calf Performance

Heifer BCS and Mean Performance Values

Parameter	2	3	4	5	6
Time to Stand (min.)	---	59.9	63.6	43.3	35.0
Total Colostrum (mls.)	750	1525	1112	1411	---
Calf IgG_1 (mg/dl)	1788	1998	2179	2310	2348
Calf IgM (mg/dl)	160	146	157	193	304

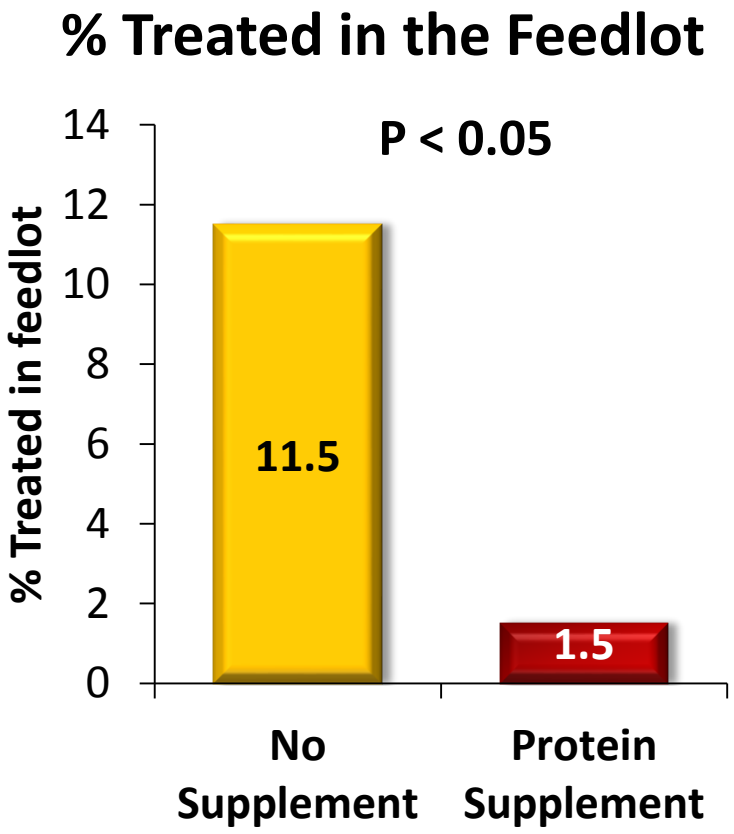
Odde - 1992

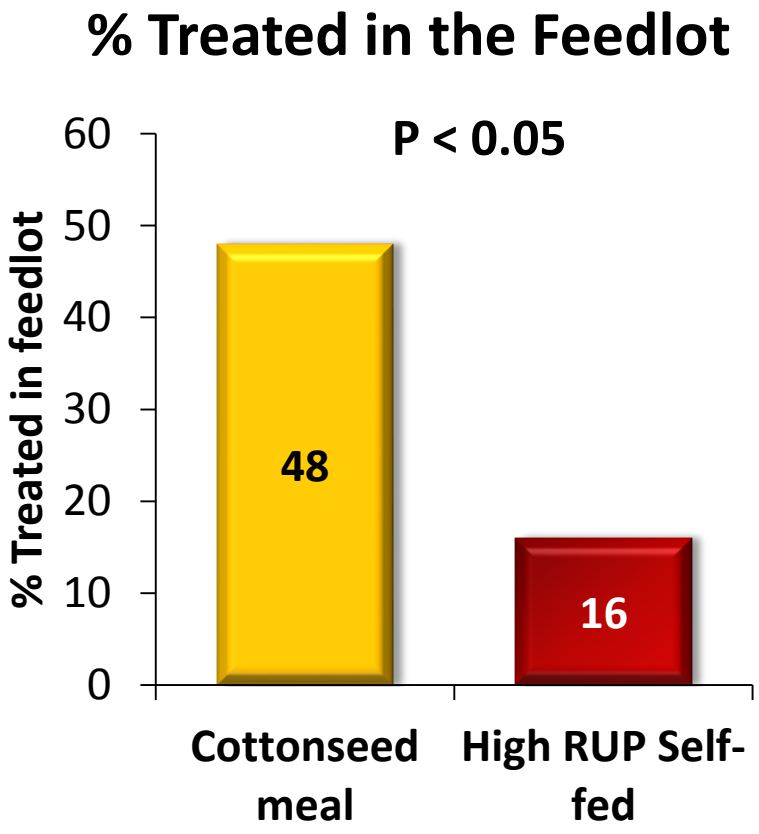
Milk Production?



Meyer et al., 2011

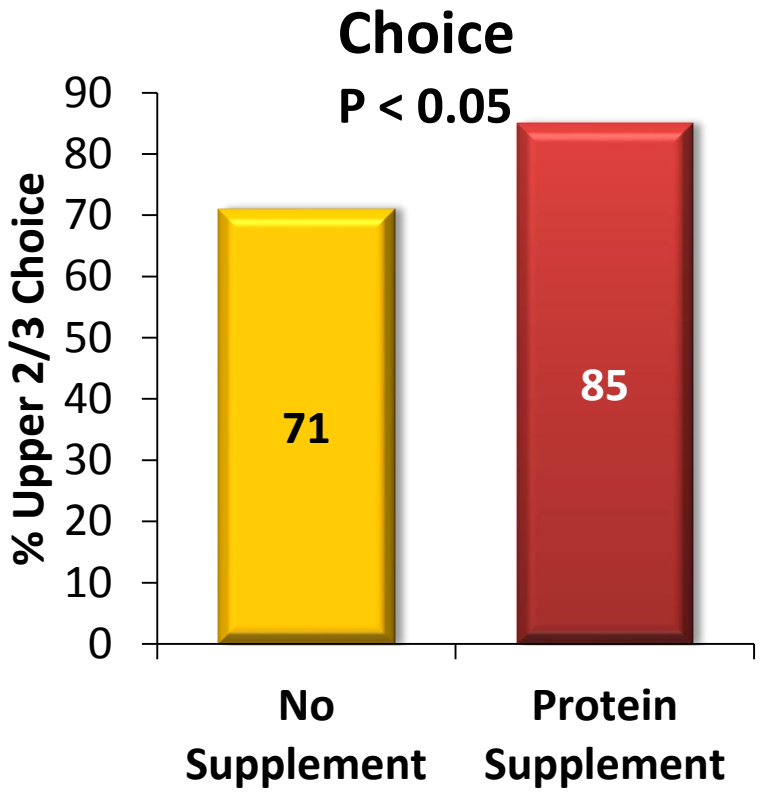
Feedlot Health

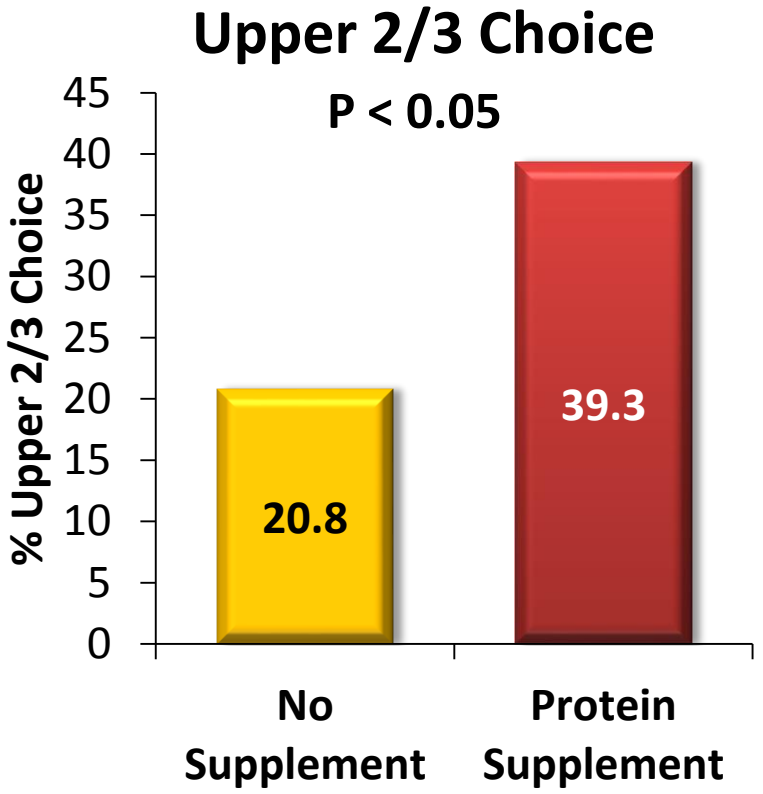




Larson et al., 2009; Mulliniks et al., 2007

Quality Grades

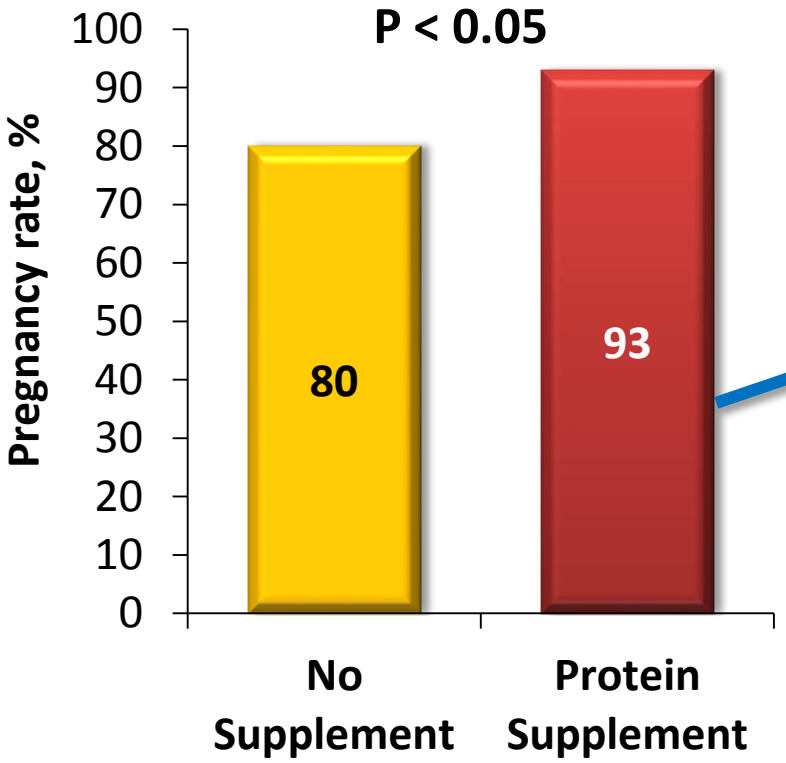




Larson et al., 2009

Reproductive Performance of Daughters

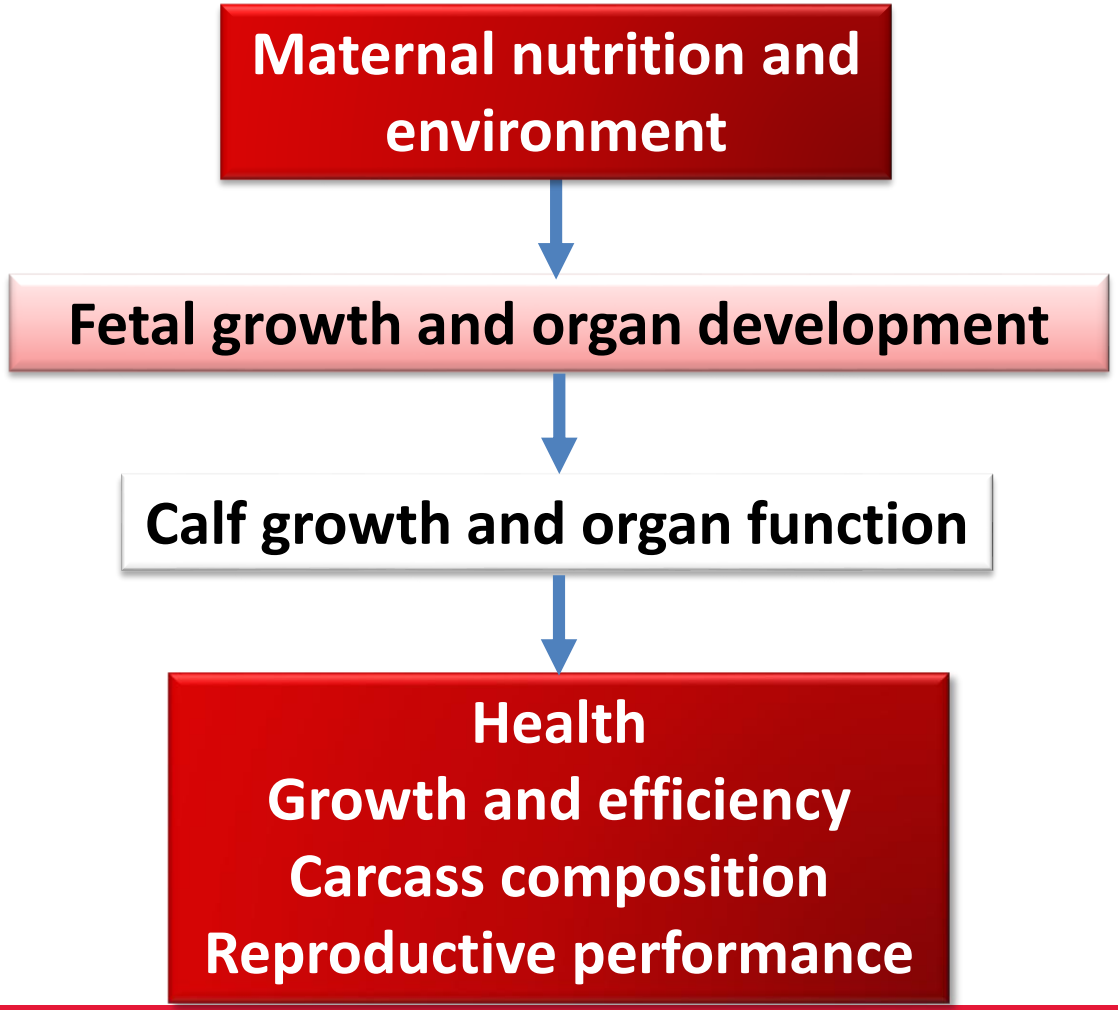
Pregnancy Rate as Heifers



77% from supplemented dams calved in first 21 days (vs. 49%)

Martin et al., 2007; Funston et al., 2008

The Big Picture of Programming



In short:

Inadequate nutrition for the cowherd has lasting impacts on all phases of production…….and ultimately the bottom line for every operation

Questions?

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