Impact of Method of Heifer Development and Post-AI Management on Reproductive Efficiency

George Perry, Ph.D.
Beef Reproduction Specialist
South Dakota State University

Goals

- **Heifers bred early**
- **Minimize calving difficulty**
- **Wean acceptable calves**
- **Longevity**
- **Economic efficiency $$**

Life-time Productivity

- The cost of developing heifers has a tremendous impact on profitability
- Heifers need to calve by 24 months of age to achieve maximum life-time productivity
- Heifers that lose a pregnancy or conceive late are likely to not have enough time to rebreed during a defined breeding season

(Patterson et al., 1992).

Importance of Getting Heifers Bred Early

Lifetime Average calf weaning weight

	Day 0-21	Day 22-42	Day 43-63
Herd 1	556	535	494
Herd 2	499	452	424
Herd 3	519	475	430
Herd 4	507	517	492
Herd 5	499	468	459

Sprott

Effect of Calving Date

- Analysis of 3700 calves at the USDA-Meat Animal Research Center indicated that for each day of age after the beginning of the calving season that a calf is born 2.4 pounds of weaning weight is lost.

(personnel communication R. Cushman)

Proper Selection
Proper Development
Getting Bred Early
Maintaining Pregnancy
=
Long term herd production and profitability

Nutrition on Embryo Development

- Heifers fed 85% maintenance requirements of energy and protein had reduced embryo development on day 3 and day 8 compared to heifers fed 100% maintenance

(Hill et al., 1970)

Heifer Development - Behavior

- Weaning is the period of time during which animals increased their consumption of forage (Lyford, 1988).
- Young ruminants learn grazing skills from mothers and other adults (Flores et al., 1989a, b, c).
- During the 1st year of life willingness to try novel food declined (Lobato et al., 1980).

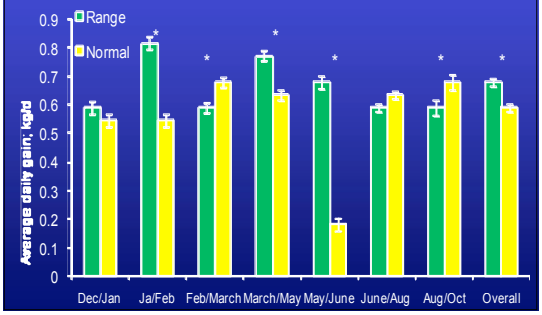
Heifer Development - Behavior

- This learning resulted in the development of preferences or aversions to plants and in the development of the motor skills necessary to harvest and ingest forages efficiently (Provenza et al., 1987).

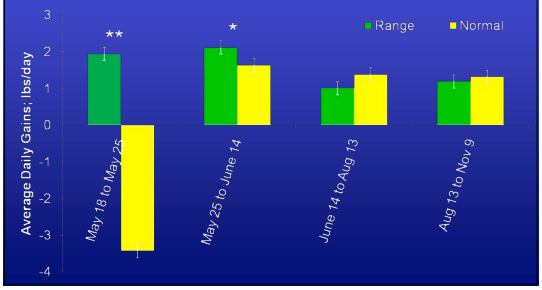
Heifer Development - Behavior

- Young livestock ingest small amounts of novel food and gradually increase the amount ingested if no adverse effects occur (Burritt et al., 1987; Chapple et al., 1986).
- When introduced to novel food livestock may spend significantly more time and energy foraging, but ingest less (Osuji, 1974 Arnold et al., 1977; Curll et al., 1983; Hodgson et al., 1981).

Forage vs Normal Development



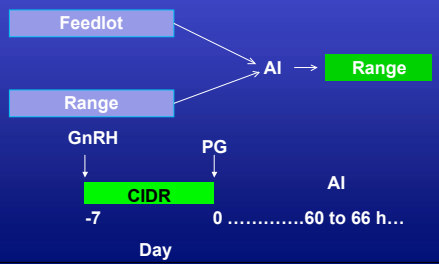
Forage vs Normal Development



Nutrition Restriction

- A decrease in feed intake from 120% of maintenance to 40% of maintenance resulted in a loss of 56.3 lbs over 2 weeks (4.03 lbs/day), and 60% of heifers becoming anovular within 13 to 15 days of diet change (Mackey et al., 1999).

Experimental Design

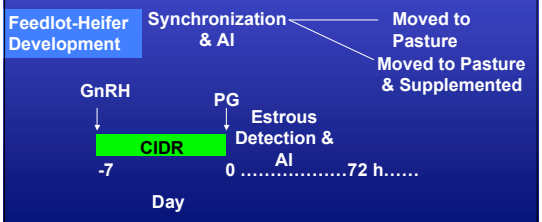


Impact of Heifer Development Method on Cycling Status and Pregnancy Success

	LOT[a]	GRASS[b]	P =
Cycling Prior to Breeding Season	94%	84%	0.10
Pregnancy Success	44%	57%	0.20

[a]Developed from weaning to breeding in a feedlot.
[b]Developed from weaning to breeding on pasture.

Experimental Design



Herd 1 n = 144; Herd 2 n = 164

Weight

	Herd 1		Herd 2	
	Pasture	Pasture & Supplement	Pasture	Pasture & Supplement
Day -7	941 ± 10	961 ± 10	872 ± 9*	921 ± 8*
Change	17 ± 3.9	15 ± 3.7	-37 ± 4*	45 ± 3*

* P < 0.01

Pregnancy

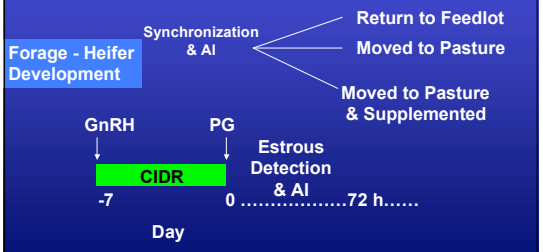
	Pasture	Pasture & Supplement	P-Value
Herd 1	34 % (24/70)	39 % (29/74)	**0.54**
Herd 2	26 % (19/74)	40 % (36/90)	**0.05**

Forage Quality and Quantity

	Herd 1		Herd 2	
	Pasture	Pasture & Supplement*	Pasture	Pasture & Supplement*
Protein	15.9%	13.8%	10.3%	8.7%
TDN	67%	62.1%	63.4%	60%
ADF	30%	34.2%	37%	41.9%
NDF	52.2%	51.4%	60.9%	65.5%
Kg/Hectare	344	202	210	156

*Plus 2.22 kg/hd/d of DDG; 24% CP

Experimental Design



n = 333

Body Condition Scores

	Feedlot	Pasture	Pasture & Supplement
Day -7	5.4 ± 0.05	5.4 ± 0.05	5.4 ± 0.05
Day 42*	5.8 ± 0.04	5.4 ± 0.04	5.9 ± 0.04

* P < 0.01

Pregnancy

	Feedlot	Pasture	Pasture & Supplement
Day 42	56%	59 %	57 %
Final*	86%	89%	88%

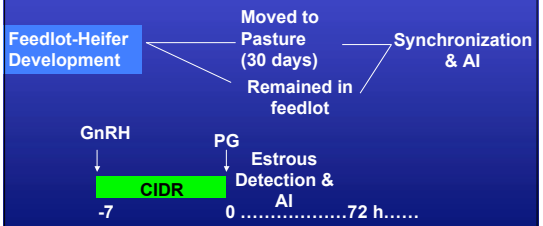
* 28 day bull exposure

Forage Quality and Quantity

	Pasture	Pasture & Supplement*	Drylot
Protein	11.5%	12.1%	17.7%
TDN	59.6%	60.5%	72.3%
ADF	34.7%	34.1%	24.1%
NDF	62%	59.7%	39.5%
Kg/hectare	205	180	

*Plus 2.22 kg/hd/d of DDG; 24% CP

Experimental Design



n = 50

Weight Gain

	Pasture	Feedlot	P =
Weight gain	17	0.6	0.07
Pregnancy rates	62%	58%	0.81
Pregnancy loss	5%	13%	
Final AI pregnancy rate	57%	46%	

Underdeveloped

- Heifers developed to gain less than a pound a day, from weaning until approximately 360 days of age had decreased pregnancy success and increased embryonic loss compared to heifers developed to gain a pound or more a day (Short and Bellows, 1971).

Overdeveloped

- Development of heifer to excess body condition negatively impacted reproductive efficiency (Patterson et al., 1992).
- Heifers developed to a body condition of 7 or 5 and nutrient restricted until they became anestrous did not resume estrous cycles until they reached a body condition score of 6.0 and 5.2, respectively (Cassady et al., 2009).

Implications

- Method by which heifers are developed and how they are managed following insemination can have a tremendous impact of the reproductive performance and the lifetime productivity of replacement heifers.

Implications

- Heifers developed in a feedlot experience decreased ADG compared to forage developed heifers when moved to spring forage.
- This decrease in ADG coincides with decreased pregnancy success.

Implications

- Therefore it is necessary to realizing that a sudden change in diet following insemination can have a tremendous impact in pregnancy success.

Thank you

- Dr. Julie Walker
- Dr. Cody Wright
- Dr. Ken Olson
- Doug Young
- Dr. Trey Patterson
- Brandi Perry
- Robin Salverson
- Sarah Fields
- Josh Nelson
- Sebastian Lares
- Amanda Schiefelbein
- Kaycee Gebhart

QUESTIONS?