Management strategies for improving lifetime reproductive success in beef heifers.

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Why are animals culled?

- 33.0% pregnancy status
- 32.1% age or bad teeth
- 14.6% economic reasons
- 3.9% other reproductive problems
- 3.6% producing poor calves
- 3.6% temperament
- 2.9% injury
- 2.7% udder problems
- 1.8% bad eyes
- 1.8% other problems

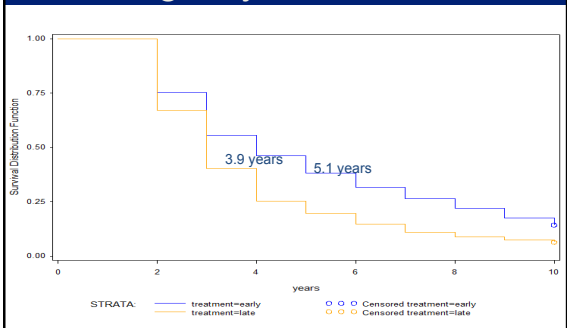
NAHMS, 2008

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

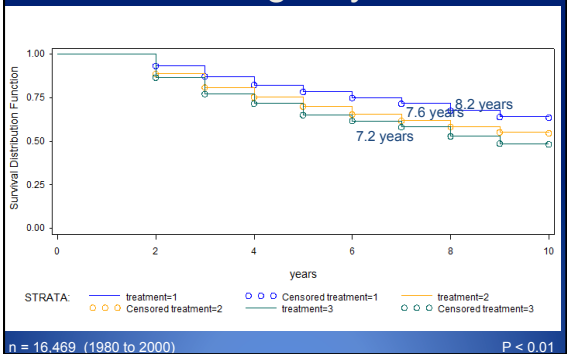
(Patterson et al., 1992).

Longevity



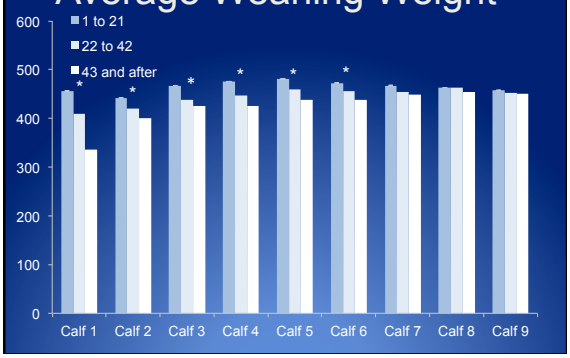
n = 2,195 P < 0.01

Longevity



n = 16,469 (1980 to 2000) P < 0.01

Average Weaning Weight



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

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).

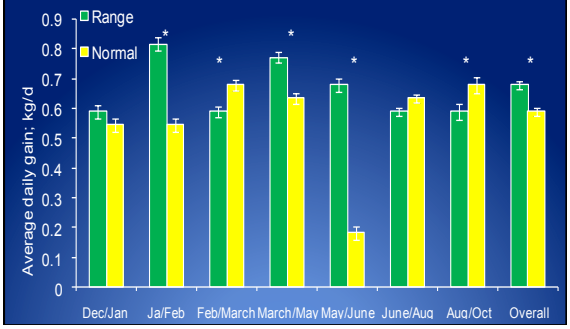
Heifer Development - Behavior

- 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).

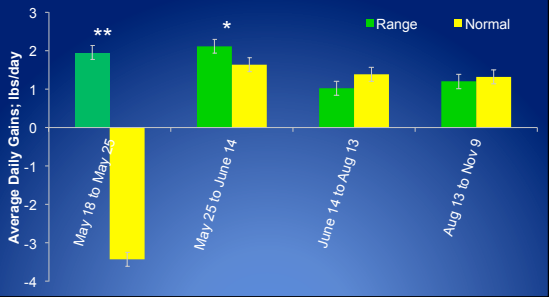
Heifer Development - Behavior

- 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



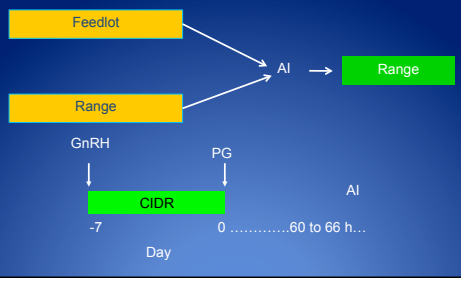
Forage vs Normal Development



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

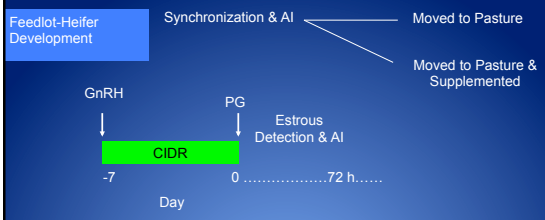


Impact of Heifer Development Method on Cycling Status and Pregnancy Success

	LOT[a]	GRASS[b]	P =
Cycling Prior to Breeding Season	98%	94%	
Pregnancy Success	45%	57%	0.10

[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
Change	17 ± 3.9	15 ± 3.7	-37 ± 4*	45 ± 3*

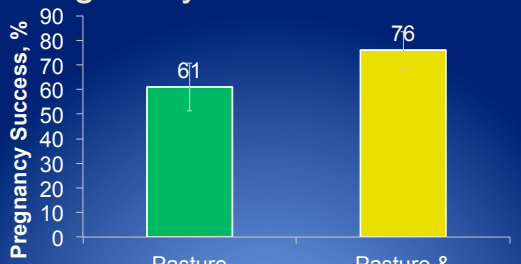
* P < 0.01

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

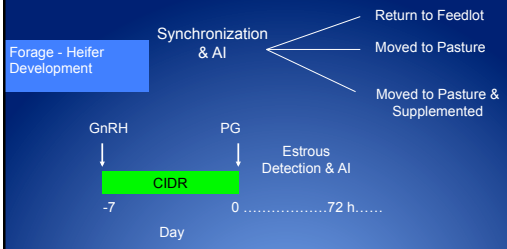
*Plus 2.22 kg/hd/d of DDG; 24% CP

Pregnancy Success



P = 0.02

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

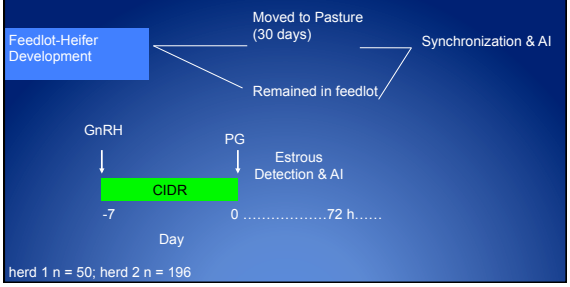
Decreased nutrition on embryo quality

Effect of post-AI nutrition on day 6 embryo characteristics

TRT	n[a]	Embryo Recovery (%)	Embryo Stage (n[b])	Embryo Quality (n[c])	Access. Sperm (n)	Dead Cells (n)	Total Cells (n)	Percent Live Cells (%)
GAIN	46	70.8 (46/65)	4.6 ± 0.1	2.0 ± 0.2	22.7 ± 3.8	7.8 ± 0.9	70.6 ± 5.6	83.3 ± 3.0
LOSE	42	62.1 (42/66)	3.8 ± 0.2	2.8 ± 0.2	16.7 ± 3.8	9.7 ± 1.0	48.9 ± 3.9	71.1 ± 4.1
P-value	.	.	< 0.01	0.02	0.64	0.42	0.03	0.01

[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)

Experimental Design



herd 1 n = 50; herd 2 n = 196

Weight

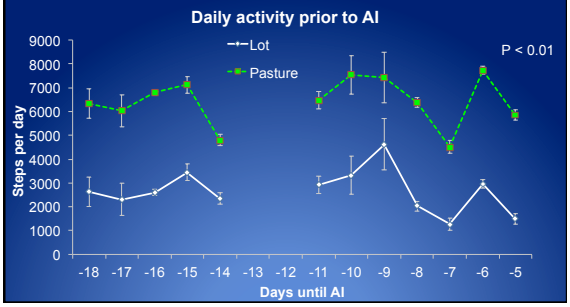
	Herd 1 (30 days)		Herd 2 (70 days)	
	Pasture	Lot	Pasture	Lot
Weight changeAI to preg check	17.1 ± 6.4*	0.6 ± 6.4*	104.7 ± 8.0**	2.8 ± 7.8**

* P = 0.07 **P < 0.01

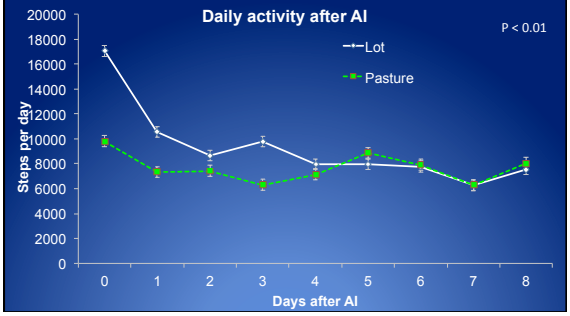
Pregnancy Success

	Pasture	Lot	
Herd 1	50 % (12/24)	46 % (11/24)	
Herd 2	59 % (57/96)	50 % (49/98)	
Total	58 % (69/120)	49 % (60/122)	P = 0.17

Grazing Behavior



Grazing Behavior



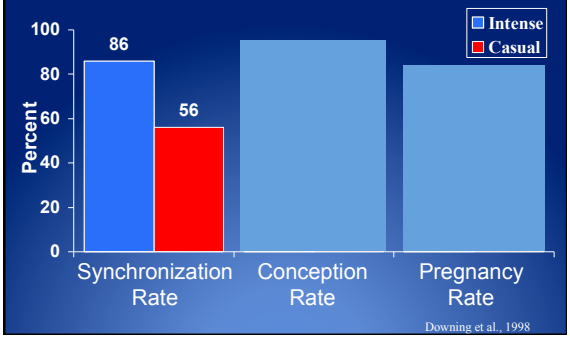
Heifer Development

- Consistency

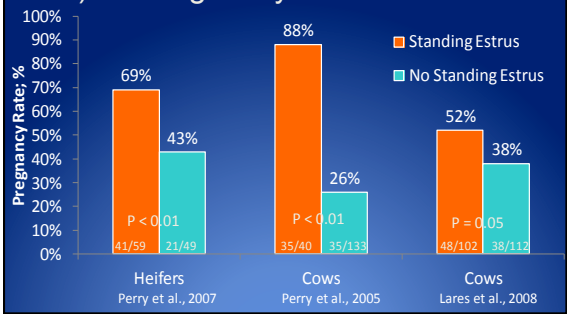
EQUATION OF REPRODUCTION

1. **Animals detected in heat and inseminated (%).**
2. **Inseminator efficiency (%).**
3. **Semen fertility level (%).**
4. **Fertility level of the herd (%).**

Importance of Accurate Heat Detection



Effect of Standing Estrus (±24 h of TAI) on Pregnancy Rates



Natural Service - Estrus Detection

Libido (Sex Drive or Willingness)

- Poor Libido (Sex Drive or Willingness) can compromise reproductive performance
  - Libido is highly heritable (as high as 0.59)
- Libido can practically be measured by closely watching a bull after introducing him to a herd of cows

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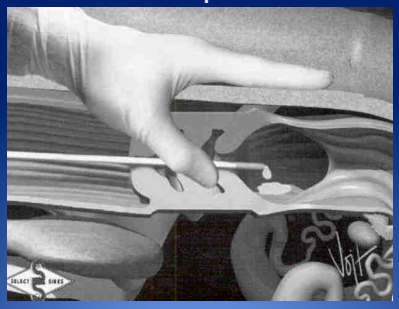
Inseminator Efficiency

When semen is deposited in the correct location at the correct time fertilization occurs > 95% of time.

Artificial Insemination

Site of semen deposition

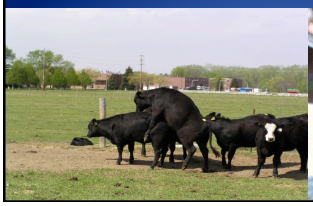


(Courtesy of Select Sires, Inc.)

Natural Service

Mating Ability

- Mating Ability is the ability for a bull to complete service
- 3.6% of 166 mature bulls with a satisfactory BSE were physically unable to serve cows *A Barth*



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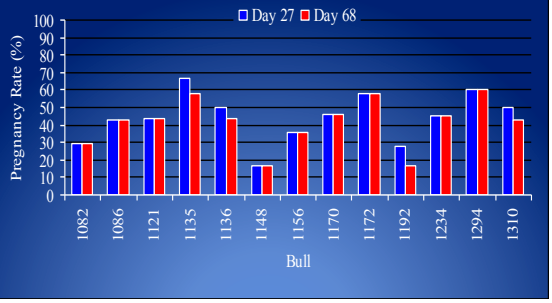
Effect of Bull on Pregnancy Rates - TAI



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Fertility level of the herd

Herd level fertility can be influenced by

1. Cycling status
2. Body condition (nutrition level)
3. Disease
4. Embryonic mortality
   - Stress

Shipping Stress

Effect of time of transport after insemination on pregnancy rates

	Days after insemination that transportation occurred			
	1 to 4	8 to 12	29 to 33	45 to 60*
Synchronized pregnancy rate	74%	62%	65%	
% pregnancy loss compared to transportation on days 1 to 4		12%	9%	6%*
Breeding season pregnancy rate	95%	94%	94%	

*Loss compared to percent pregnant prior to transportation (pregnancy determined by transrectal ultrasonography)

Data adapted from Harrington et al., 1995, and T. W. Geary unpublished data

Time course of early bovine embryo development

Event	Day
Estrus	0
Ovulation & Fertilization	1
First cell division	2
8-cell stage	3
Migration to uterus	5-6
Blastocyst	7-8
Hatching	9-11
Maternal recognition of pregnancy	15-17
Attachment to the uterus	19
Placentation	25
Definitive attachment of the embryo to the uterus	42
Birth	285

Data adapted from: (Shea, 1981, Flechon and Renard, 1978, Peters, 1996, Telford et al., 1990)

EQUATION OF REPRODUCTION

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90% x 95% x 90% x 95% = 73%

Conclusion

- Consistency in heifer development
- Details in every aspect of reproduction