

Reproductive Tract Scoring

2014 Applied Reproductive Strategies in Beef Cattle Symposium



U.S. Beef Industry

- The U.S. Beef Industry has been challenged with a significant long-term decline in cattle numbers ...

January 1 U.S. Beef Cow Inventory 1934-2014
2014 Inventory 28,042,400

Okla. Beef Cow Inventory

Year	Inventory (x 1000)
2011	~2050
2012	~1750
2013	~1700
2014	~1850

NASS, 2014

U.S. Beef Industry

- Declines have been recently driven, in part by...
 - record high input and production costs...
 - variable costs...
 - fixed costs...
- and
 - severe drought conditions over the last few years in many of the nation's major cattle producing states...

Rusche, 2014

U.S. Beef Industry

- As the industry moves to rebuild the nation's cowherd - one of the major changes that separate current conditions from previous years...
 - the increased market value of replacement females...
- As values have increased for replacement females...
 - ...so has the losses incurred when females are culled too soon because of reproductive failure...

Rusche, 2014

Oklahoma Beef Industry

- As Oklahoma moves to rebuild its cow numbers, the focus will turn to heifer retention and appropriate practices related to beef heifer development...
- A range of procedures are available to cow-calf producers to aid in reproductive management of replacement beef heifers and determine the outcome of a development program...

Patterson and Brown, 2013

Oklahoma Beef Industry

- On-farm development programs that involve local veterinarians, state, regional, and county livestock specialists, and individual farm and ranch operators provide the structure from which change within the Oklahoma Beef Industry can occur...

Patterson et al., 2011

Infertility

Infertility (and economic losses) of beef females may be attributed to three primary groups:

1. females that fail to become pregnant during the breeding season (usually 60 – 120 days)...
2. females that become pregnant but fail to calve...
3. females that become pregnant late in the breeding season...

Lamb, G.C., 2013.

Selecting Replacement Heifers

Selection of heifers that...

- have a greater opportunity to become pregnant early in the first breeding season... Lamb, 2013
- *very few producers know the pubertal status of their heifers before the start of the breeding season because observing behavioral estrus is labor intensive...*
- Age at Puberty (AP) is defined as the age at which a heifer first exhibits estrus and ovulates... Holm, 2009

Selecting Replacement Heifers

- research has demonstrated up to a 21% increase in fertility from the pubertal estrus to the third estrus of a heifer... Byerley et al. 1987; Perry et al., 1991
- *when you consider that the breeding season for heifers frequently begins 2 to 3 weeks before the cows... and ...the fertility of heifers bred at their pubertal estrus is lower than the third estrus...
...heifers need to reach puberty at least 6 to 10 weeks before one begins breeding cows to increase the proportion of heifers that conceive early...*

Atkins et al., 2013

Selecting Replacement Heifers

Selection of heifers that...

- calve without difficulty within a desired age (usually by 2 years of age)... Lamb, 2013
- *beef heifers that calve at 2 years of age produce more calves in their lifetime than heifers that calve first at 3 years of age or older...* Donaldson, 1968

Selecting Replacement Heifers

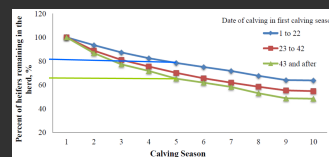
Selection of heifers that...

- reinitiate postpartum estrous cycles to become pregnant again during the subsequent breeding season...
- *the single largest economic loss to beef producers...*
- *infertility that leads to the failure of a beef female to calve during the subsequent calving season...*

Lamb, 2013

Selecting Replacement Heifers

- Heifers calving early in their 1st calving season have greater lifetime productivity and are more likely to become pregnant at 2 yrs. of age... Lesmeister, et al. 1973; Lamb 2013



Influence of calving date within the USMARC heifers (n= 16,469)...

Average Longevity (yrs.) for USMARC heifers:

1 - 22 = 8.2 ± 0.3
 23 - 42 = 7.6 ± 0.5
 > 43 = 7.2 ± 0.1

Selecting Replacement Heifers

- The tendency is to choose the oldest and largest heifers...
 - selecting heifers that are heaviest at weaning will increase the percentage that are pubertal at a year of age...
 - however, not all of the heaviest heifers will have initiated reproductive cycles...

Cushman and Perry, 2012

Reproductive Tract Scoring

- A reproductive tract score (RTS) system was developed to assist beef producers with selection of potential replacement heifers before initiation of the breeding season and to estimate pubertal status...

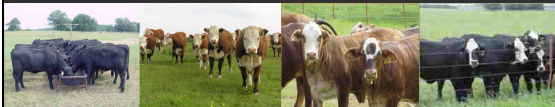
Andersen et al., 1991



Reproductive Tract Scoring

- is a subjective estimate of sexual maturity (pubertal status) in heifers based on rectal palpation of ovarian activity (structures on ovary) and size of the reproductive tract (uterus and uterine horns)...
- Reproductive Tract Score:
 - 1 (immature) through 5 (cycling)

Andersen et al., 1991



Description of Reproductive Tract Score

Reproductive Tract Score	Uterine Horns	Ovaries			Ovarian Structure
		Length (mm)	Height (mm)	Width (mm)	
1	Immature < 20 mm diameter, - no tone	15	10	8	No palpable follicles
2	20 to 25 mm diameter, - no tone	18	12	10	8 mm follicle
3	25 to 30 mm diameter, - slight tone	22	15	10	8-10 mm follicle
4	30 mm diameter - good tone	30	16	12	>10 mm follicle, Corpus luteum possible
5	> 30 mm diameter, - good tone, erect	>32	20	15	>10 mm follicle, Corpus luteum present

Reproductive Tract Scoring

Possible Applications:

1. a screening test to determine the pubertal status of heifers before the breeding season...

Andersen, 1991

2. an indication of the nutritional needs of heifers when sufficient time is allowed before the breeding season...

Brinks, 1993

3. a selection tool for age at puberty (AP)

Pence et al., 2007

Reproductive Tract Scoring

- Has been shown to be:
 - repeatable (between and within) veterinarians...
 - an accurate measure of pubertal status...

Rosenkrans and Hardin, 2003

- Estimated Heritability:

- 0.32 Andersen et al., 1991

- 0.28 Martin et al., 1992

Reproductive Tract Scoring

- Pre-breeding examinations that include RTS should be performed 30 to 60 days prior to breeding...
- Heifers with an RTS of 1 in most cases should be culled...
- If most heifers in a group are assigned an RTS below 4, it is recommended that the producer investigate the prepubertal status of the heifers to determine whether there were problems related to the development program...

Poock and Payne, 2013

Reproductive Tract Scoring

- RTS has been demonstrated to be a good predictor of which heifers will conceive...
- Heifers with higher RTS in both AI and Natural Service groups became pregnant earlier in the breeding season compared with heifers with lower RTS...
- Heifers assigned an RTS of 1 or 2 experience longer days to AI and reduced pregnancy rates... Gutierrez, 2014
- there is a positive correlation between RTS and pregnancy rates within a 50-day AI season as well as reproductive success in the subsequent breeding season... Holm, 2009

Effect of reproductive tract score on AI and/or breeding season pregnancy in Angus cross beef heifers (n = 4041) in ranches that used AI and natural service bulls (n = 2660) or natural service only (n = 1381) in the breeding programs.

Reproductive tract score	AI and natural service group			Natural service only group	
	n	AI-PR (%)	BS-PR (%)	n	BS-PR (%)
1 and 2	108	40.7 ^a	81.2 ^{a,d}	72	79.7 ^{a,d}
3	596	48.3 ^a	86.5 ^{a,d}	283	84.3 ^{a,b,d}
4	736	57.6 ^b	90.4 ^{b,d}	370	88.4 ^{b,d}
5	1220	64.6 ^c	95.2 ^{c,d}	656	90.2 ^{b,e}

Gutierrez, 2014

RTS	Angus-X beef heifers		Median Days to Pregnancy	
	AI-NS	NS	AI-NS	NS
< 2	4.1%	5.2%	28.5 ^a	60 ^b
3	22.4%	20.5%	25 ^a	60 ^b
4	27.7%	26.8%	10 ^a	53 ^b
5	45.8%	47.5%	10 ^a	37 ^b

Reproductive Tract Scoring

- An advantage of implementing a progestin-based (i.e. CIDR or MGA) estrus synchronization protocol is that you will be able to induce estrus and ovulation in the heifers with a RTS of 3...

Smith and Perry, 2012
Gutierrez, 2014

Looking forward

- Reproductive tract scoring will be a useful tool for selection of heifers in a Oklahoma heifer development system...
 - Increase reproductive success of replacement females.
 - Increase lifetime productivity of heifers.
- Provide unique opportunity for collaboration between producers, extension staff and veterinarians to enhance beef production in Oklahoma.
- Provide additional value for the Oklahoma beef industry.