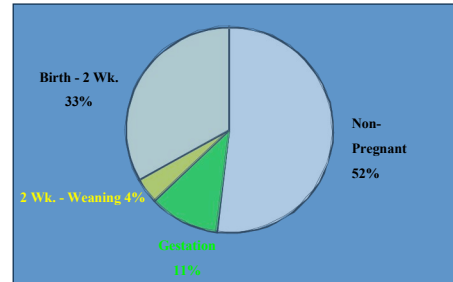


Bull Management and Nutrition

Julie Walker, George Perry, Russ Daly
and Ken Olson
South Dakota State University

Reproductive Losses

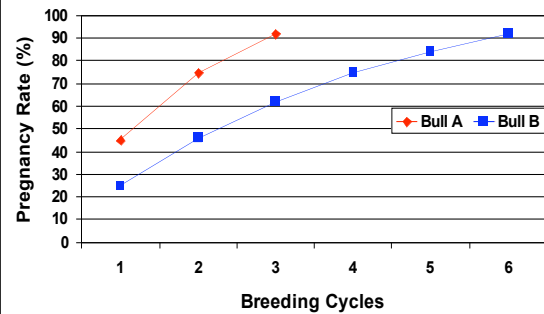


USDA, Miles City, MT

Herd Bull

- Influences overall herd fertility
 - Loss of Fertility = Loss of Calf Crop
 - 20% of unselected bulls are sub-fertile or infertile
- Most powerful method of genetic improvement
 - The Herd bull provides half the genetics to all the calves he sires
 - Greater than 90% of beef cows are bred by natural service

Return on Investment



Return on Investment (Bull A)

Group	Age	ADG	Birth Wt.	Weaning Wt.	# of Calves	Lbs. Weaned
1	209	2	85	503	45	22635
2	188	2	85	461	30	13830
3	167	2	85	419	17	7123
4	146	2	85	377		
5	125	2	85	335		
6	104	2	85	293		
				Pounds Weaned		43588
				Average WW	Calf Loss (5%)	2179
				465	Pounds Weaned	41409

Return on Investment (Bull B)

Group	Age	ADG	Birth Wt.	Weaning Wt.	# of Calves	Lbs. Weaned
1	209	2	85	503	25	12575
2	188	2	85	461	21	9681
3	167	2	85	419	16	6704
4	146	2	85	377	13	4901
5	125	2	85	335	9	3015
6	104	2	85	293	8	2344
				Pounds Weaned		39220
				Average WW	Calf Loss (5%)	1961
				419	Pounds Weaned	37259

Return on Investment

Two bulls with the same pregnancy rate

	<u>Bull A</u>	<u>Bull B</u>
Breeding Periods	3	6
Pounds Weaned	41,409	37,259
Benefit		+4,150 lbs
Market Price (\$0.90/Lb)		\$3,735



Puberty

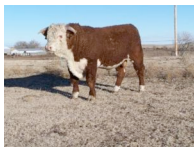
- An ejaculate contains
 - ❖ $\geq 50 \times 10^6$ total sperm
 - ❖ $\geq 10\%$ progressive motility
- Best practical indicator of puberty is a scrotal circumference between 27 and 29 cm (Lunstra et al., 1978)
- Only 35%, 60%, and 95% of 12, 14, and 16 month old bulls are reproductively mature (Barth, 2000)

Nutrition



Pre-breeding Conditioning of Bulls

- 60-day period prior to breeding season
- If new bulls are purchased, place them with other bulls they will be working with to establish a social structure
- Ensure that bulls are given ample area for exercise
 - Remain sound longer and have a higher degree of libido throughout the breeding season



Yearling Bulls

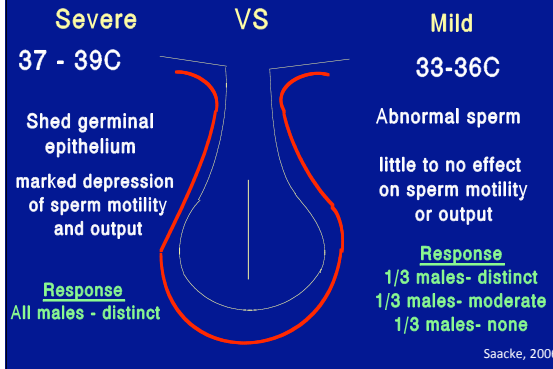


- Well-grown, but not fat; ~BCS 6
 - Fat bulls may fatigue rapidly, resulting in fewer conceptions
 - BCS 6
 - Spongy fat over all ribs, hooks and pins. Shoulder muscle movement is slightly visible. Fat deposits appear in brisket.
- Must reach puberty 3-4 months prior to breeding season
- Should be gaining weight and maintaining condition 120 days prior to breeding
 - Will lose approximately 100 lbs during breeding

Highly Fitted Bulls

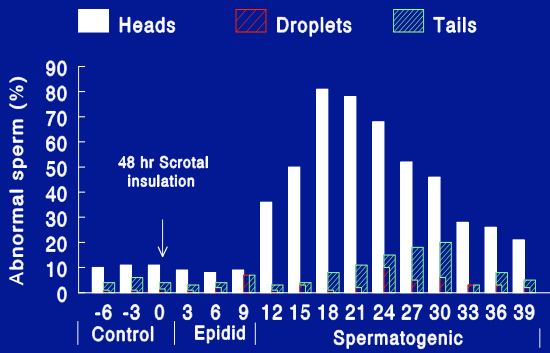
- Adapting bulls from high plane of nutrition to grass
 - Need to do this gradually, do not dump them out to "rough it"
 - Start them on a ration similar to the one they came off of at 60-70% of intake
 - Reduce at the rate of 10% per week
 - Done prior to turn out
 - Dramatic changes in nutrition can have a negative effect on semen production

Impaired thermoregulation of the testes



Effect of scrotal insulation (mild)

(Vogler et al. 1992)



Effect of scrotal insulation on embryo quality: effect of semen with abnormal sperm and nuclear vacuoles vs control

Cows	Embryos	Semen	EX-Gd	FR - PR	Deg	Deg/UFO
7	90	d -3	74.4	11.1	14.4	0
8	85	d +21	38.3	21.2	35.3	4.7

Vacuoles = day 21 post insulation
Control = day 3 before insulation

Saacke, 2006

Two Year Old Bulls

- Ration not as critical, as they are near mature weight
- 1300 lb bull need to gain ~1 lb/day
 - 35 lbs of feed per day
 - 5-7 lbs of grain
 - 12% CP diet
- Should be in BCS 6 prior to breeding

Daily Nutrient Requirements for maintenance and slow rate of growth (regain body condition) of mature bulls

Weight of bull (lb)	Ave. Daily Gain (lb)	Dry matter intake (lb)	Protein Intake (lb)	Crude Protein (%)	TDN (%)
1300 *	1.0	25.4	1.9	7.5	55.8
1600 *	0.0	26.5	1.8	6.8	48.4
2000 *	0.0	31.3	2.1	6.7	48.4

Sell, Glenn. Management of Beef Bulls F-3254. Oklahoma State University Cooperative Extension

Post-Breeding Nutrition

- Appraise the bulls and sort into three groups
 - Mature bulls in good condition
 - Growing young bulls and thin bulls that need extra care
 - Salvage bulls to be marketed

Nutrition

- No specific feed ingredient
- Balance ration based on size, age, desired growth rate
- Use Body Condition Scoring
- Do not forget the mineral and vitamins

Health

- Develop health protocol with your local veterinarian
 - Vaccinations
 - Parasite control
 - Biosecurity plan

Conditions that affect the individual bulls

- Johne's Disease
 - Bacterial disease with long incubation period
- Lameness due to injury or infection
- Pinkeye
- Vesiculitis
 - Enlargement of seminal vesicles

Possible herd conditions

- Bovine Viral Diarrhea (BVD)
 - Many different strains "a family of viruses"
- Trichomoniasis
 - Agent = *Trichomonas foetus*, a protozoa
- Leptospirosis
 - Bacterial abortion disease
- Vibriosis
 - Bacterial disease
- IBR- Infectious Bovine Rhinotracheitis (Red Nose)
 - Virus disease that can cause abortions
- Impacts the profitability through reduced number of calves born.



Breeding Soundness Exams

Physical Soundness

“Breeding Soundness Exam”

Scrotal Circumference

Sperm Motility

Sperm Morphology



Satisfactory Bulls

Testing Stations	SC1	SC2	SC3	TN1	TN2
Percent satisfactory	72.7	76.1	80.3	73.1	63.3
Observations	723	731	313	1027	854

Kennedy et al. 2002

Physical Soundness

Bulls must be physically capable to breed a cow

- Conformation – Feet & Legs
 - Especially hind legs
 - Many conditions hereditary
- General Health
 - Eyes
- Scrotum & Contents
- Rectal Exam
 - Vesicular Glands



Visual Detection



Smell



Structure

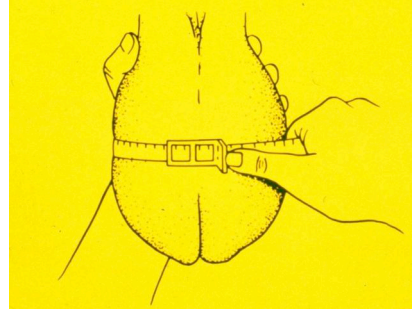


Scrotal Circumference

What does scrotal circumference tell you?

- It is a measure of testicular tissue (daily sperm production)
- Bulls with larger scrotums have
 - sons with larger scrotums
 - daughters that reach puberty at a younger age

Measuring Scrotal Circumference



Minimum Scrotal Circumference Requirements

Age in months	Scrotal Circumference (cm)
≤ 15	30
> 15 ≤ 18	31
> 18 ≤ 21	32
> 21 ≤ 24	33
≥ 24	34

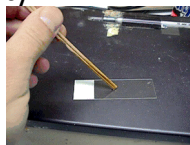
Chenoweth et al. 1992

Semen Quality

- What is included?
 - Ejaculate volume = # of mL of semen ejaculated
 - Sperm motility = % of sperm with progressive (headfirst) movement
 - Sperm morphology = % of normal sperm in the ejaculate
- Can it change?
 - Substandard nutrition
 - Temperature
 - Disease

Sperm Motility

- Gross (“group”) motility
- Individual motility
- SFT minimum: 30% individual motility and/or fair gross motility
- Studies: 0.21 – 4% disqualified due to poor motility



Sperm Morphology

- SFT Minimum: 70% or greater normal sperm
- Studies: 9.6 – 52 % unsatisfactory due to poor morphology



Sperm Morphology

- **Primary**
 - Originate in testis
- **Secondary**
 - Originate in epididymis, transport, or handling

Semen Quality

	Year 1		Year 2	
	Random Group	≥ 80% Normal Sperm	Random Group	≥ 80% Normal Sperm
Cows Exposed	655	675	1282	808
No. of Bulls	26(~1:25)	27(~1:25)	51(~1:25)	33(~1:25)
No. Pregnant	571	656	1179	769
% Pregnant	87%	93%	85%	90%
% Increase		6%		5%

(Wiltbank and Parish, 1986)

Factors not tested in BSE

- The ability to produce good semen does NOT guarantee reproductive performance
 - Libido
 - Mating Ability
 - Serving Capacity
 - Social Dominance

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

Timing of Estrus

<u>Time of day</u>	<u>% in Estrus</u>
6 a.m. to 12 noon	26%
12 noon to 6 p.m.	18.1%
6 p.m. to midnight	26.9%
Midnight to 6 a.m.	29.0%
55.9% between 6 p.m. and 6 a.m.	

Hurnik and King, 1987; Xu et al., 1988; G. A. Perry unpublished data

Mating Ability

- Mating Ability is the ability for a bull to complete service

Male-to-Female Ratio (Serving Capacity)

- Recommendations range from 1:10 to 1:60
 - A Rule of Thumb is to place the same number of cows/heifers with a young bull as his age in months.
 - Yearling bulls have a lower serving capacity than older bulls
 - Synchronization places greater pressure on bulls and lowers serving capacity
 - Multiple sire pastures decrease serving capacity since multiple sires will mate a individual cow

Social Dominance

Rank	Group 1	Group 2	Group 3	Group 4	Group 5
Bull 1	30%	34%	44%	92%	75%
Bull 2	21%	29%	18%	3%	25%
Bull 3	12%	21%	16%	3%	0%
Bull 4	10%	6%	4%		
Bull 5	9%	4%	4%		
Bull 6	9%	1%	4%		
Bull 7	5%	1%	2%		
Bull 8			2%		
Bull 9			2%		
Bull 10			0%		
Calves	73	64	43	28	32

(Lehrer et al., 1977)

Summary

- Nutrition impacts reproductive fertility
- Balance rations to meet nutrient requirements
- Develop health protocol with veterinarian
- Select bulls that are
 - Physically sound
 - Large Scrotal circumference
 - High Semen Quality
- Observe bulls during the breeding season
- Breeding Soundness Exams yearly

