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BREEDING SOUNDNESS EVALUATION OF BULLS

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Introduction

Fertility of breeding bulls is one of the most important economic considerations to the commercial cattle producer. Other factors such as genetics and nutrition of the breeding stock become secondary in economic importance when you consider that the use of a healthy, well managed, **infertile** bull could result in no calves and the loss of 100% of the marketable calf crop. In a herd of 550 bulls, approximately 33% failed a breeding soundness exam performed according to the Society for Theriogenology standards.

Prior to June 1993 the Texas Department of Criminal Justice(TDCJ) beef cattle operation consisted of 13 farms on 13 separate Prison Units and consisted of approximately 6,000 cows and 550 breeding bulls. In June 1993 the format changed. One centrally located farm became designated as the unit to house and care for the breeding bulls, when they were not out with the cows. All the bovine females on that unit were dispersed to other farms. This programmatic change allowed improved attention to bull health and improved record keeping.

The recorded data included the age, breed, date, body-condition score, results of the breeding soundness exam of the individual bulls and results of fecal exam on selected bulls. The objective was to determine if age, breed, season, body-condition score, intestinal helminths, coccidia, liver flukes, the interaction of parasites and body condition, and the interaction of breed and season were associated with failed breeding-soundness examinations. Individual defects in the morphology exam were recorded as: 1. Head defects 2. Midpiece defects 3. Spermatogenic tail defects and 4 handling and storage defects.

Methods

Age

Registered beef breeding bulls are purchased from breeders. The date of birth and breeder's identification brand are recorded. As the replacement bulls are purchased, a

unique identification number is assigned to each bull that tracks him through the computer and, in addition to the brand, is used to record the result of the various evaluations done on a periodic basis. The bulls in the bull herd ranged from 2 years to 8 years.

Breed

The following breeds were represented in the bull herd: Angus, Brangus, Brahman, Hereford and Simmental.

Season

The cow herd is divided into a fall, winter and spring herd. The fall herd is exposed to the bulls during December and January. The winter herd is exposed to the bulls during February and March. The spring herd is exposed to the bulls during May and June. Breeding soundness exams(BSE) are completed on the bulls within 30 days prior to each breeding season. Results are recorded using the criteria approved by the Society of Theriogenology. Thirteen different units comprise the beef enterprise. The number of breeding females and the breeding season utilized is determined by the land acreage available on the different units. Bulls are assigned to the units based on the number and breed type of the females on each unit.

Body condition score

Body condition scores are recorded as part of the BSE and are also recorded after each breeding season.

Fecal evaluation

Fecal samples were collected as the bulls came through the working chute for BSE evaluation. If a bull did not pass the BSE his fecal sample was blocked with the next two bulls through the chute that passed the BSE

Intestinal helminths. Parasite eggs were identified and recorded by fecal flotation

Coccidia. Were identified in the same fecal flotation as used for intestinal helminths

Flukes. Were identified using the "Wisconsin fluke finder" to show fluke eggs and identify the species.

Herd Health

The bulls were treated for flukes and intestinal helminths in the fall while BSE evaluations were completed. They were vaccinated for leptospirosis, and campylbacteriosis and 8-way clostridia at the time of this working. In the spring the bulls were treated for intestinal helminths and vaccinated for leptospirosis, cammpylobacter, anaplasma and 8 way clostridia.

Analysis

For initial analysis, season was divided into winter, spring and summer, breed was coded as a 5-level variable (Angus, Brahman, Brangus, Herefords and Simmental) and age treated as classification variable with a separate class for each birth year. Variables for intestinal helminths, coccidia and liver flukes were coded as positive, if any oocytes or helminth eggs were found to be present in the fecal examination. Initial analyses were performed using chi-square analysis for association and also chi-square for trend for the variable age.

For multi variate analysis, breed was recorded as Hereford or other, season was recorded as summer or other, and age was coded as a continuous variable. Variables significant at $p<0.05$ in the initial analysis were then modeled using path analysis.

Results

Results were obtained from 381 bulls during the months January to July in 1994.

Figure 1. Age of bull and passing proportions for breeding-soundness examinations.

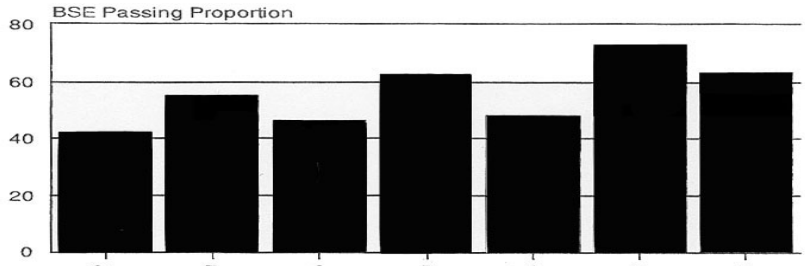


Figure 2. Breed of bull and passing proportions for breeding-soundness examinations.

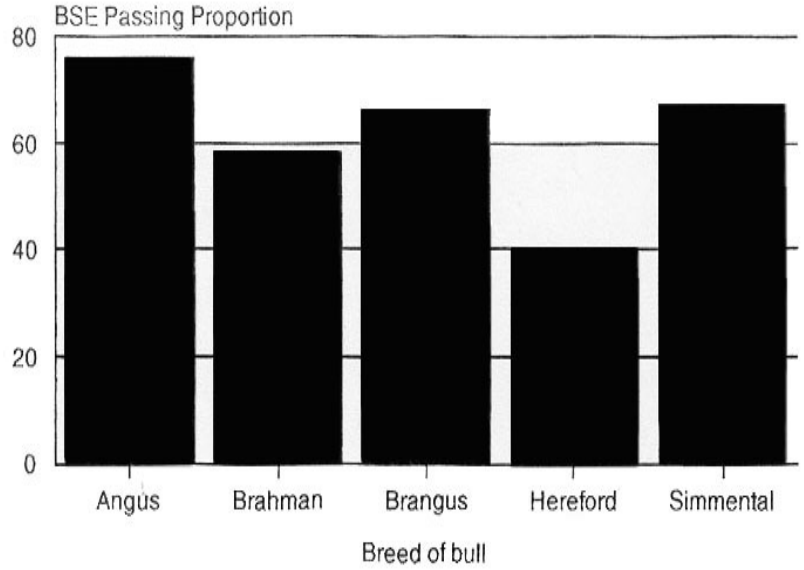
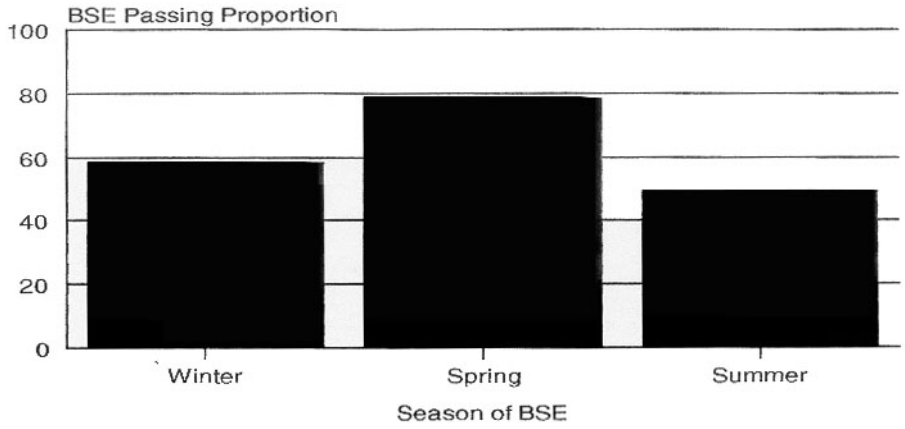
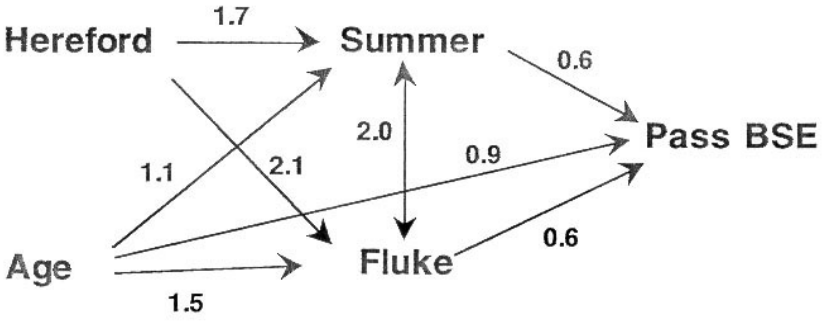


Figure 3. Season of breeding-soundness examination and passing proportions.

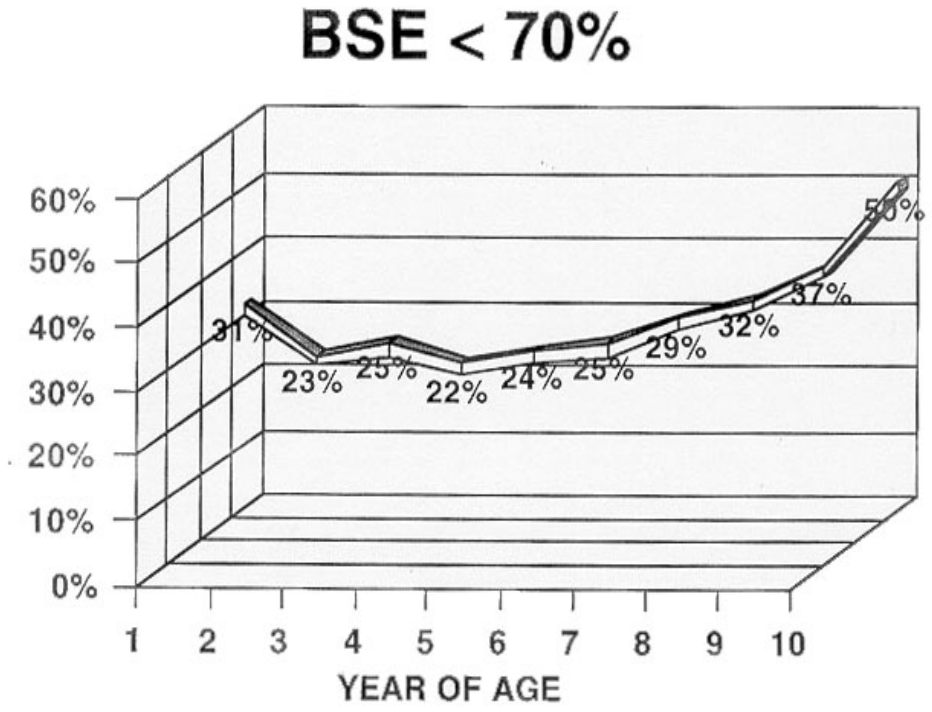


Body-condition score, intestinal helminths and coccidia were not significantly ($p > 0.1$) associated with results of the breeding-soundness examinations. Bulls positive for fluke infestation were more likely to have a failed breeding-soundness examination (odds ratio = 1.29; 95% confidence interval 1.05 to 1.56). This association was independent of body condition score.

Figure 4. Results of Path Analysis. All odds ratios were significant at $p < 0.1$



	<2 year	2 year	3 year	4 year	5 year	6 year	7 year	8 year	9 year	10 year
1998		17	22	9	6	12	100	25	100	50
1997	0	12	21	13	11	33	35	0	17	0
1996	100	17	14	10	62	24	33	40	14	0
1995	39	15	14	37	37	17	32	35	22	0
1994	24	14	37	25	25	32	34	41	67	0
1993	24	65	43	39	67	33	38	50	0	0
	187	140	151	133	141	151	272	191	220	
Average	**31%**	**23%**	**25%**	**22%**	**24%**	**25%**	**29%**	**32%**	**37%**	**50%**



Total number bulls evaluated =3,638

Six year summation of Bulls scoring under 70% normal morphology

Seventy percent normal morphology score is necessary for a bull to be designated as a "satisfactory potential breeder". The graph is based on this morphology score. Bulls that failed to pass a physical exam or a semen motility score are not included in the data, The data records that 31% of all the bulls evaluated at less than 2 years of age failed to pass the morphology exam. This should not be used as an excuse not to test these yearling bulls. On the contrary, early maturity is an inherited trait and beef herds trying to upgrade the fertility of the cow herd would be well served to evaluate these young bulls and use the morphology score as a selection tool for future herd sires. This is not to say that young bulls that fail an BSE exam at an early will not pass at a later date when they have had more time to mature.

The failure rate from 2 years of age to 6 years of age is relatively constant at about 25% of each age group. This answers the question of the necessity of testing all bull prior to each breeding season. The breeding-soundness exam does not predict libido and, therefore, it is necessary to observe bulls soon after they are put with cycling females to assess their actual performance.

There is some evidence that a correlation exists between a BSE score and the number of calves sired. Two bulls that we evaluated never produced a semen sample in spite of numerous attempts to collect them. Another one in the group never had a morphology score over 46% normal sperm. The administration maintained that these 3 bulls could be called "non-breeders" until they were exposed to fertile females. The 3 bulls were put into single sire traps, each with 5 normal, cycling heifers for 45 days. The two aspermatic bulls did not achieve any pregnancies during this time and the bull with less than 46% normal morphology only achieved one pregnancy. In a similar small study from South Africa, there were similar correlations to pregnancy rates achieved by 3 bulls; one with acceptable semen morphology achieving over 80% pregnancies, one with intermediate semen morphology achieving 50% pregnancies and one with low semen morphology achieving almost no pregnancies. Even though these are very small studies, they do indicate that if libido is acceptable, then morphology scores are important predictors of pregnancy rates. Beyond age 7 the failure rates begin to increase significantly.

Texas Department of Criminal Justice Beef Cattle Program:

Prior to 1993 the beef cattle program was conducted on 16 different farms, and consisted of a total of 6,000 cows and 550 bulls. In June 1993 all the bulls were moved to a central farm unit and all the cows on that unit were redistributed to other units. A detailed health record was instituted, as well as a detailed BSE record for each bull. That is when the data already presented was initiated. Over the last 12 years the cow herd(including replacement heifers) has grown to about 16,000 females. The bull herd has been reduced to 300 bulls. The cow herd is divided into spring calving herd, fall calving herd, and a winter calving herd. The replacement females are bred one month ahead of the corresponding cow herd. Until very recently a 60 day breeding season has been utilized. The pregnancy percent has averaged approximately 88

Discussion

Age

The path model suggests that as a bull grows older, his chances of passing the morphology part of the BSE decrease. Analysis of the larger set of data accumulated over the whole five-year period would suggest that a yearling bull has a greater risk of failing the BSE than bulls over 2 years of age. This is probably due in large part by the fact that young bulls of various breeds mature at different rates. The *Bos indicus* bulls mature at a later age than do the *Bos tarus* and are the best example of this interaction between age and sexual maturity. There seems to be no significant increase in the BSE failure rate between the year of age and the sixth year of age. Beginning the seventh year of age the BSE failure rate begins to increase at a significant rate.

Breed

The number of different breeds failing a BSE was not different significantly with the exception of the Herefords. This probably does not represent the total population of the Hereford breed, but is rather an interaction of our particular set of Hereford bulls

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Body Condition Score

The ideal body condition score (BCS) for breeding bull is thought to be between BCS 5 and BCS 6 on a scale of 1 to 9 (1 equates to very thin and 9 to very fat). Bulls that lost condition in the 60 days prior to evaluation exhibited a severe negative impact on the BSE. This is evidenced by young bull's BSE scores coming off "gain trials" where they were BCS 8 or 9 at the end of the trial and were then allowed to lose BCS rapidly. Older bulls allowed to gain BCS up to 8 or 9 react the same as yearling bulls when allowed to lose BCS rapidly. The problem is that the fat in the neck of the scrotum insulates the testis and causes the temperature pf the testis to be elevated. Thus, you may be presented with bulls with a BCS of 5 and have them to fail the BSE if they were BSC 8 or 9 in the previous 60 days prior to examination. Bulls that consistently maintained BCS of 4 ("hard keepers") showed no detrimental effects on fertility caused by the BCS 4.

Intestinal Helminths and/or Coccidia

The data suggest that the presence of intestinal parasites does not have a detrimental impact on BSE scores unless overt signs of parasitism are present.

Flukes

The presence of liver flukes has a definite impact on fertility, but this effect seems to have additional factors which are necessary to create the most apparent impact on

fertility. This effect may be an interaction with the number of adult flukes in the liver and the length of time they have been present. The present techniques of fecal egg counts do not correlate to the number of adult flukes present in the liver. Controlled research will be necessary to actually delineate the interaction necessary to have a negative impact on BSE scores.

Interaction with BCS and Parasites

An older bull with liver flukes is over twice as likely to fail the BSE as a younger bull with no liver flukes. As long as the bull is not losing BCS due to internal parasites (other than flukes), the presence of internal parasites has no adverse effect on fertility.

Interaction with Breed and Season

The data shows that the Hereford bulls experienced a tremendous negative impact with the presence of flukes, particularly in the summer months. This may not be representative of the Hereford breed as a whole, but may be the result of our particular population of Hereford bulls. It may also be a function of different levels of exposure on different farm units. The data have not been examined to evaluate this supposition.

Conclusions

The failure rate of the morphology exam has decreased at the present time to approximately 12%. The pressure applied to the bulls is at least partially responsible for this decline in failure rates. Additional changes are the deworming schedule, which has been changed to the use of a flukacide preparation at least twice a year, if not more often. Increased attention is being paid to the body score of individual bulls, in order to have them in optimum body condition prior to each breeding season. The bulls are managed as groups , but also as individuals.

Bulls that fail the Breeding Soundness Exam, and those that are inconsistent in their record of evaluation are culled. This makes room for the bulls that are consistent performers. The different breeding seasons make it possible to expose the bulls to increased numbers of females that might not otherwise be possible.

All the emphasis can not be placed on the bulls. The cow herd must also be in acceptable body condition, in order for them to become pregnant. Adverse weather conditions can place a strain on pregnancy rates. When heat and humidity are too high the cows may cycle, but will not sustain a pregnancy. Cold, wet, windy conditions can also have detrimental effects on pregnancy rates.