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Abstract
Scrotal circumference measurements and other data were collected on 4,218 Angus, Red Angus, Brangus, Charolais , Gelbvieh, Hereford, Polled Hereford, Limousine, Salers, and Simmental bulls born in the spring of 1991. All were participants in selected on-farm and central bull tests. Our objectives for the study were to develop 205-and 365-day age-adjustment factors for scrotal circumference and derive a 365-day scrotal circumference prediction equation based on adjusted 205-day scrotal circumference. We determined that a 205-day scrotal circumference of approximately 21 cm is necessary to reach 32 cm at 1 year. Age-of-dam adjustment factor for 205-day scrotal circumference is +.8 cm for 2- and 3- year-old dams. The factor for 365-day circumference is +.6 cm for 2-year-old dams.

Keywords
Cattlemen's Day, 1995; Kansas Agricultural Experiment Station contribution; no. 95-357-S; Report of progress (Kansas State University. Agricultural Experiment Station and Cooperative Extension Service); 727; Beef; Beef cattle; Scrotal circumference; Age adjustment

YEARLING SCROTAL CIRCUMFERENCE PREDICTION EQUATION AND AGE ADJUSTMENT FACTORS FOR VARIOUS BREEDS OF BEEF BULLS

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Summary

Scrotal circumference measurements and other data were collected on 4,218 Angus, Red Angus, Brangus, Charolais ,Gelbvieh, Hereford, Polled Hereford, Limousine, Salers, and Simmental bulls born in the spring of 1991. All were participants in selected on-farm and central bull tests. Our objectives for the study were to develop 205-and 365-day age-adjustment factors for scrotal circumference and derive a 365-day scrotal circumference prediction equation based on adjusted 205-day scrotal circumference. We determined that a 205-day scrotal circumference of approximately 21 cm is necessary to reach 32 cm at 1 year. Age-of-dam adjustment factor for 205-day scrotal circumference is +.8 cm for 2- and 3-year-old dams. The factor for 365-day circumference is +.6 cm for 2-year-old dams.

(Key Words: Beef Cattle, Scrotal Circumference, Age Adjustment.)

Introduction

Previous research has indicated an important relationship between yearling scrotal circumference of beef bulls and the semen traits: sperm motility, percent normal sperm, percent primary abnormalities, percent secondary abnormalities, semen volume, sperm concentration, and total sperm. Yearling scrotal circumference also has been found useful in describing age at puberty.

The Society of Theriogenology recommends a minimum scrotal circumference of 30 cm for yearling bulls to ensure satisfactory reproductive performance. Many cattleman prefer bulls with yearling scrotal circumferences at least 32 cm. The limited information available indicates a high relationship between weaning and yearling scrotal circumference.

Yearling scrotal circumference has been reported as moderately to highly heritable. Yearling scrotal circumference in bulls also is correlated highly with age at puberty and with some performance traits of their female offspring.

Our objectives were to develop 205- and 365-day scrotal circumference age adjustment factors and derive a 365-day scrotal circumference prediction equation based on adjusted 205-day scrotal circumference.

Experimental Procedures

Scrotal circumferences and other data were collected on 4,218 bulls born in the spring of 1991. The breeds included Angus, Red Angus, Brangus, Charolais, Gelbvieh, Hereford, Polled Hereford, Limousin, Salers, and Simmental. All were participants in selected on-farm and central bull tests starting in the fall of 1991. Three scrotal circumference measurements were taken; at the start of the test, midway through, and at the end of the test. At each measurement, weight and date also were recorded. The measuring procedure is described in the Manual for Breeding Soundness Examination of Bulls (Journal of Theriogenology) . Other information collected included location of test, pedigree information, and age of dam.

The 205-day scrotal circumference adjustment factors were developed using least squares analysis by breed, while limiting the age range to 160 to 250 days. The model included contemporary group as a fixed effect and age as a regression. The adjustment factor the linear

regression of age on scrotal circumference. The procedure for the 365-day scrotal circumference adjustment factor was identical, except the age range was 320 to 410 days. A 365-day scrotal circumference prediction equation, based on adjusted 205-day scrotal circumference, was developed by regressing adjusted 365-day scrotal circumference on adjusted 205-day scrotal circumference for each breed.

Least squares procedures were used to determine an age-of-dam effect for both 205- and 365-day scrotal circumferences. The age range again was limited from 160 to 250 days for the 205-day measurement and 320 to 410 days for 365 days. The model included contemporary group, breed, age of dam, and age of calf. Ages of dams were grouped into five categories: 2, 3, 4, 5-8, and 9+ years.

Results and Discussion

Table 1 shows the adjustment factors for each breed that would enable breeders to adjust scrotal circumferences to 205 or 365 days of age. As indicated by the differences between weaning and yearling factors, scrotal circumference does not increase at the same rate between weaning and yearling ages. These 365-day scrotal circumference adjustments were slightly higher than some studies have indicated.

Other studies have found age of dam to have a significant effect on scrotal circumference. These adjustment factors should not be used within our prediction equations, but rather as a means of comparing individual bulls for selection purposes. For 205-day scrotal circumference, bull calves out of 2- and 3-yr-old dams should be adjusted by adding .8 cm. For 365-day scrotal circumference, calves out of 2-yr-old dams should be adjusted by adding .6 cm.

The "B" values from Table 2 were used to estimate adjusted 205-day scrotal circumference necessary to average 32 cm at 1 year. With the exception of Herefords, the breeds were fairly similar. In general, bulls needed about 21 cm scrotal circumference at weaning to reach 32 cm at 1 year.

Age adjustment factors for 205- and 365-day scrotal circumferences will allow more accurate comparisons between bulls. Adjusted scrotal circumferences will make selection more accurate, just as adjusted 205-day weights have made selection for weaning weight more accurate.

Because many bull buyers prefer yearling scrotal circumferences of at least 32 cm, seedstock producers could reduce costs by eliminating those bulls at weaning that would likely fail to reach 32 cm at a year. The 365-day scrotal circumference prediction equation and the table of minimum scrotal circumferences should serve as guidelines for producers to identify and cull those individuals. The age-of-dam adjustments can make comparisons involving calves out of younger dams more accurate.

As an example, assume that an Angus bull from a 2-year-old dam is 220 days old when his scrotal circumference was measured as 22 cm. His adjusted 205-day scrotal circumference would be [22 + .0856 × (205 – 220) + .8] = 21.5 cm. The adjustment factor of .0856 came from Table 1, and the age-of-dam adjustment would be .8 cm. The predicted 365-day scrotal circumference would be [1.54 × 20.7] = 31.9 cm. The regression coefficient (B) of 1.54 was taken from Table 2. When predicting the yearling scrotal circumference, the 205-day age-of-dam adjustment would not be used.

Another example might be two Simmental bulls in a yearling contemporary group. One bull had a 36 cm scrotal circumference measured at 352 days of age, and his dam was 2 years old. His adjusted 365-day scrotal circumference would be [36 + .0543 × (365 – 352)] = 36.7 cm, plus .6 cm for age-of-dam adjustment = 37.3 cm. The second bull was from a mature dam and had a measured scrotal circumference of 35.5 cm at 370 days of age. His adjusted 365-day scrotal circumference would be [35.5 + .0543 × (365 – 370)] = 35.2 cm, or 2.1 cm less than that of the first bull.

Table 1. Adjustment Factors (cm/day) for 205- and 365-Day Scrotal Circumferences

Breed	205 Adj	365 Adj
Angus	.0856	.0374
Red Angus	.0585	.0324
Brangus	.0861	.0708
Charolais	.0767	.0505
Gelbvieh	.0839	.0537
Hereford	.0416	.0425
Polled Herefor d	.0969	.0305
Limousin	.0465	.0590
Salers	.0594	.0574
Simmental	.0854	.0543

Table 2. Regression Coefficients (B) to Predict Yearling Scrotal Circumference and the Weaning Scrotal Circumference Needed to Expect a Yearling Scrotal Circumference of 32 cm

Breed	No. of Bulls[a]	B[b]	Standard Deviation	Weaning Scrotal[c] Circumference
Angus	623	1.54	.17	20.8
Red Angus	275	1.55	.14	20.6
Brangus	108	1.60	.17	20.0
Charolais	280	1.54	.16	20.8
Gelbvieh	181	1.48	.13	21.6
Hereford	90	1.41	.15	22.7
Polled Hereford	121	1.53	.15	20.9
Limousin	68	1.60	.19	20.0
Salers	88	1.59	.17	20.1
Simmental	393	1.59	.17	20.1

[a]Number of bulls used to estimate the regression coefficients

[b]Regression coefficients. The adjusted 205-day scrotal circumference multiplied by B gives the expected 365-day scrotal circumference.

[c]The 205-day scrotal circumference needed to produce an average yearling scrotal circumference of 32 cm.