Twenty year trends of bull breeding soundness examimations at a teaching hospital

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Introduction:

The origin of the Society for Theriogenology has its roots in breeding soundness examination (BSE) of bulls as the western blizzard of 1954 lead to the evaluation of bulls by the founders of the Society. Today bull BSEs are still one of the more common procedures performed by food animal veterinarians. Bull BSEs are one of the most economically strategic procedures required in natural service cattle herds. In well-managed herds with short breeding and calving seasons bull BSEs are vital to their productivity and economic success. Since bull BSEs are such an important part of the food animal industry it remains extremely important to teach proper techniques to future food animal veterinarians as well as provide a service for local clientele.

In the fall of 1992, the Society for Theriogenology adopted new individual and herd BSE forms. Under these guidelines, a satisfactory potential breeder must be acceptable on all four parts of the examination. The four parts consist of a physical examination, minimum scrotal circumference based on age, minimum progressive motility of 30%, and minimum normal morphology of 70%. After examination the final classifications are: satisfactory for bulls meeting minimum standards for the four parts of the examination and unsatisfactory or deferred for bulls not meeting one or more of the minimum standards. Deferred classification allows for reevaluation at a specified time for conditions in the opinion of the examiner that might improve. The 1992 form replaced a form used in the 1970's and 1980's which evaluated the same criteria but was based on a point system and had final classifications of: satisfactory, questionable or unsatisfactory. Prior to the 1970's a point system was used which evaluated visual concentration, vigor (gross motility) and live dead ratio; obvious problems existed with this system.

Materials and methods

Breeding soundness examination records (1992 form) for client bulls from the Auburn University Teaching Hospital were reviewed and data tabulated. For comparison three different time periods were evaluated: 1993-1995, 2006-2008 and 2009-2013. The 1993-1995 and 2006-2008 data were hand tabulated and recorded while the 2009-2013 utilized the Society for Theriogenology computer software for bull breeding soundness and Excel spreadsheet for recording and tabulation. A complete BSE was performed on each bull. Bulls were restrained in a squeeze chute and examinations were performed by one or more clinicians. Physical examination and scrotal circumference measurements were done prior to semen collection. Semen was collected by electroejaculation. Bulls with poor motility or high numbers of secondary abnormalities initially were immediately recollected. Each time a bull was presented was considered one examination for tabulation purposes; therefore a small number of bulls may have been represented more than once due to reevaluations. The population consisted of bulls consigned to sales, recent purchases, bulls offered for sale at private treaty and herd bulls. Herd bulls retained in the herd were often presented in multiple years. Breed composition was primarily beef bulls with Holsteins being the only dairy breed examined. Examinations were conducted in the teaching hospital and in the field.

For each time period the following data were tabulated and compared: 1. Total number of bulls examined and number of bulls per year; 2. Breeds of bulls represented 3. Age of bulls when examined; 4. Results of examinations all ages (satisfactory, unsatisfactory, deferred); 5. Age and percent satisfactory; 6. Age and percent unsatisfactory; 7. Percent deferred by age; 8. Combination of unsatisfactory and deferred by age; 9. Reasons for unsatisfactory and deferred all ages; 10. Combined reasons for unsatisfactory and deferred all bulls; 11. Inadequate scrotal circumference all bulls; 12. Inadequate scrotal circumference by breed; and 13. Inadequate scrotal circumference by age for 2009-2013. Since the three time periods were not the exact same in length the data in most cases are presented in percentages rather than exact numbers. Data were statistically evaluated using a SAS program.

Results

The total number of bulls examined for each of the time periods and the number of bulls per year is shown in Table 1. The various breeds of bulls examined are shown in Table 2. The age of the bulls when examined is illustrated in Table 3. The results for all bulls for each time period appears in Table 4.

Table 1
Total number of bulls examined for each time period and number of bulls examined per year

1993-1995	2006-2008	2009-2013
1276 bulls	1076 bulls	1943 bulls
638 bulls/year	538 bulls/year	485 bulls/year

Table 2
The various breeds of bulls examined for each time period and percentage of total

1993-1995 (1276 total)	2006-2008 (1076 total)	2009-2013 (1943 total)
AN (323) 25%	AN (776) 72% *	AN (1322) 68% *
CH (221) 17%	CH (38) 3.5%	CH (34) 1.75%
SM (183) 14%	SM (75) 7%	SM (77) 3.96%
HO (107) 8%	HO (16) 1.5%	HO (0) 0%
LM (97) 8%	LM (6) 0.5%	LM (2) 0.1%
HE (89) 7%	HE (53) 5%	HE (86) 4.43%
BM (51) 4%	BM (3) 0.3%	BM (2) 0.1%
BA (47) 4%	BA (61) 5.7%	BA (204) 10.5% *
GV (39) 3%	GV (9) 0.8%	GV (24) 1.25%
RA (25) 2%	RA (22) 2%	RA (5) 0.26%
Other (102) 8%	Other (18) 1.7%	Other (187) 9.62%
• Difference P>.05		

The ages of bulls examined both number and percent classified as satisfactory appears in Table 5 while age of bull vs number and percent unsatisfactory is in Table 6. Age of bulls and number and percent deferred is represented in Table 7 and the combined unsatisfactory and deferred classifications are in Table 8. The reasons for unsatisfactory and deferred classifications combined are shown in Table 9. Combination of reasons for unsatisfactory and deferred are shown in Table 10. Numbers and percent of all bulls with insufficient scrotal circumference for each time period is shown in Table 11. Percent insufficient scrotal circumference for the most prevalent breeds for all time periods is represented in Table 12. Insufficient scrotal circumference by age for the 2009-2013 time period is illustrated in Table 13. A breakdown of satisfactory and combined unsatisfactory and deferred by the more prevalent breeds for the geographic area and the reasons for unsatisfactory and deferred are shown by breed for the 2009-2013 time period in Table 14.

Table 3

Age of bulls and percent of total when presented for examination for each of three time periods

Age	1993-1995 (1276 total)	2006-2008 (1076 total)	2009-2013 (1943 total)
</= 15 months	(146) 11.4%	(196) 18.2%	(200) 10.3%
>15 </= 18 months	(179) 14%	(164) 15.2%	(144) 7.4%
>18 </= 21 months	(211) 16.5%	(57) 5.3%	(72) 3.7%
>21 </= 24 months	(129) 10.1%	(38) 3.5%	(557) 28.6% *
>24 </= 36 months	(273) 21.4%	(198) 18.4%	(339) 17.4%
>36 </= 48 months	(129) 10.1%	(113) 10.5	(199) 10.2%
4-5 years	(108) 8.5%	(177) 16.5%	(202) 10.4%
5-6 years	(58) 4.5%	(102) 9.5%	(126) 6.5%
6-7 years	(21) 1.6%	(23) 2.1%	(55) 2.8%
>7 years	(22) 1.7%	(8) 0.74%	(28) 1.4%
*Difference P>.05			

Table 4

Examination results all ages combined for each time period

	1993-1995	2006-2008	2009-2013
Satisfactory	(802/1276) 62.9%	(806/1076) 74.9%	(1372/1943) 70.6%
Unsatisfactory	(369/1276) 28.9%	(172/1076) 16%	(482/1943) 24.8%
Deferred	(105/1276) 8.23%	(98/1076) 9.1%	(89/1943) 4.6%
Unsatisfactory/Deferred	(474/1276) 37.2%	(270/1076) 25.1%	(571/1943) 29.4%

Table 5

Age of bulls vs number and percent classified satisfactory for each time period

Age	1993-1995	2006-2008	2009-2013
</= 15 months	(83/146) 56.8%	(127/196) 64.8%	(120/200) 60.0%
>15 </=18 months	(125/179) 69.8%	(113/164) 69.0%	(82/144) 57.2%
>18 </= 21 months	(125/211) 59.2%	(38/57) 66.0%	(48/72) 66.7%
>21 </= 24 months	(83/129) 64.3 %	(31/38) 81.6%	(375/557) 67.3%
>24 </= 36 months	(179/273) 65.5%	(75/198) 76.8%	(263/339) 77.6%
>36 </= 48 months	(86/129) 66.7%	(87/113) 76.8%	(159/199) 79.9%
4 -5 years	(68/108) 63%	(147/177) 83.1%	(144/202) 71.3%
5 – 6 years	(31/58) 53.5%	(78/102) 76.5%	(99/126) 78.6%
6 – 7 years	(10/21) 47.6%	(21/23) 90.1%	(46/55) 83.6%
>7years	(12/22) 54.6%	(4/8) 50.0%	(20/28) 71.4%

Table 6

Age of bulls vs number and percent unsatisfactory for each time period

Age	1993-1995	2006-2008	2009-2013
</= 15 months	(41/146) 28.1%	(24/196) 12.2%	(51/200) 25.5%
>15 </= 18 months	(40/179) 22.4%	(31/164) 19.0%	(52/144) 35.9%
>18 </= 21 months	(61/211) 28.9%	(14/57) 23.7%	(23/72) 31.9%
>21 </= 24 months	(37/129) 28.7%	(4/38) 10.5%	(166/557) 29.8%
>24 </= 36 months	(80/273) 29.3%	(35/198) 17.7%	(68/339) 20.1%
>36 </= 48 months	(35/129) 27.1%	(15/113) 13.3%	(32/199) 16.1%
4 – 5 years	(35/108) 32.4%	(25/177) 14.1%	(48/202) 23.8%
5 – 6 years	(31/58) 37.9%	(18/102) 17.6%	(23/126) 18.3%
6 – 7 years	(10/21) 47.6%	(2/23) 9.5%	(8/55) 14.6%
>7 years	(8/22) 36.6%	(4/8) 50.0%	(6/28) 21.4%

Table 7

Age of bulls vs number and percent deferred for each time period

Age	1993-1995	2006-2008	2009-2013
</=15 months	(22/146) 15.1%	(45/196) 23.0%	(29/200) 14.5%
>15 </= 18 months	(14/179) 7.8%	(18/164) 11.0%	(10/144) 6.9%
>18 </= 21 months	(25/211) 11.9%	(6/57) 10.5%	(10/72) 1.4%
>21 </= 24 months	(9/129) 7.0%	(3/38) 7.9%	(16/557) 2.8%
>24 </= 36 months	(14/273) 5.2%	(11/198) 5.6%	(8/339) 2.3%
>36</=48 months	(8/129) 6.2%	(6/113) 5.2%	(10/199) 5.0%
4-5 years	(5/108) 4.6%	(5/177) 2.8%	(8/202) 4.0%
5-6 years	(5/58) 8.6%	(6/102) 5.9%	(4/126) 3.2%
6-7 years	(1/21) 4.8%	(23) 0%	(1/55) 1.8%
>7 years	(2/22) 9.1%	(8) 0%	(2/28) 7.1%

Table 8

Age of bulls and numbers and percent for combined unsatisfactory and deferred for each time period

Age	1993-1995	2006-2008	2009-2013
</=15 months	(63/146) 43.1%	(69/196) 35.2%	(80/200) 40.0%
>15 </=18 months	(54/179) 30.2%	(49/164) 30.0%	(62/144) 42.8%
>18 </= 21 months	(86/211) 40.8%	(19/57) 33.8%	(24/72) 33.3%
>21 </= 24 months	46/129) 35.7%	(7/38) 18.4%	(182/557) 32.7%
>24 </= 36 months	(94/273) 34.4%	(46/198) 23.3%	(76/339) 22.4%
>36 </= 48 months	(43/129) 33.3%	(21/113) 18.3%	(44/199) 21.9%
4-5 years	(40/108) 37.0%	(30/177) 16.9%	(56/202) 27.8%
5-6 years	(27/58) 46.5%	(24/102) 23.5%	(27/126) 21.4%
6-7 years	(11/21) 52.4%	(2/23) 9.5%	(9/55) 16.4%
>7 years	(10/22) 45.4%	(4/8) 50.0%	(8/28) 28.6%

Table 9

Reasons for combined unsatisfactory and deferred classification for all bulls for each time period

	1993-1995	2006-2008	2009-2013
Total Unsat/Deferred	(474/1276) 37.2%	(270/1076) 25.1%	(571/1943) 29.4%
Physical	9.5%	10.4%	5.4%
Scrotal Circumference	12.5%	3.7%	13.5%
SC/Morphology	11%	2.6%	0.35%
Morphology	52.1%	61.0%	72.7%
Physical/Morphology	5.1%	7.4%	1.1%
Motility/Morphology	4.2%	9.3%	5.4%

Table 10

Percent combined reasons for unsatisfactory and deferred for all bulls for each time period

	1993-1995	2006-2008	2009-2013
All Physical	12.4%	20.8%	6.8%
All Scrotal Circum.	27.0%	7.0%	14.8%
All Morphology	76.0%	84.4%	81.3%
All Motility	8.5%	14.8%	6.7%

Table 11

Number and percent insufficient scrotal circumference all bulls for each time period

1993-1995	2006-2008	2009-2013
(59/1276) 4.6%	(18/1076) 1.69%	(77/1943) 3.96%

Table 12

Percent insufficient scrotal circumference by most prevalent breeds for each time period

Breed	1993-1995	2006-2008	2009-2013
AN	10%	1.2%	2.8%
CH	15%	0%	2.9%
SM	2%	0%	0%
HE	14%	5.7%	4.6%
BA	17%	6.6%	13.9% *
*difference P>.05			

Table 13

Insufficient Scrotal Circumference by age

20009-2013 Number and Percent

Age	Number	Percent
</= 15 months	6/200	3.0%
>15</= 18 months	3/144	2.0%
>18</= 21 months	4/72	5.0%
>21</= 24 months	47/557	8%
>24</= 36 months	14/339	4.1%
>36</= 48 months	2/196	1.0%
4-5 years	0	0%
5-6 years	0	0%
6-7 years	0	0%
>7 years	1/28	3.6%

Table 14
Most prevalent breeds results for the 4 criteria for BSE and total 2009-2013

Breed	S U/D	Physical	SC	Morph	Motility	Total
An	S	1299/ 98.3%	1284/97.1%	1017/76.9%	1299/98.3%	958/72.5%
	U/D	23/ 1.7%	38/2.8%	305/23.1%	23/ 1.7%	364/27.5%
CH	S	34/ 82.9%	33/ 97.1%	27/ 79.4%	34 / 100%	26 / 76.5%
	U/D	7/ 17.1%	1/ 2.9%	7 / 20.6%	0	8 / 23.5%
SM	S	61 / 100%	61 / 100%	50 / 82%	60 / 98.4%	49 / 81.7%
	U/D	0	0	11 / 18.0%	1 / 1.6%	12 / 20.0%
HE	S	83 / 100%	79 / 95.2%	71 / 85.5%	82 / 98.8%	66 / 79.5%
	U/D	0	4 / 4.8%	12 / 14.5%	1 / 1.2%	17 / 20.5%
BA	S	200 / 99%	174 / 86.1%	136 / 67.3%	198 / 98.0%	102 / 50.5%
	U/D	2 / 1.0%	28 / 13.9%	66 / 32.7%	4 / 2.0%	100 / 49.5%
			*	*		*

*difference P>.05

Discussion

The total number of bulls examined per year (Table 1) declined steadily over the three periods. This decline in numbers is reflective of the decrease in the cattle population of the United States and similarly the Southeast region. The breeds of bulls (Table 2) changed dramatically over time with a variety of breeds being represented in period 1993-1995 but as time progressed Angus bulls became by far the predominant breed in the two more recent time periods. In time period 2009-2013 the Brangus breed made an increase in numbers as in the last few years the breed has become popular in the Southeast. Holsteins decreased from time period 1993-1995 as most natural service dairies in our area have dispersed.

Across all time periods (Table 3) the most common age bulls were presented for examination was 24-36 months. In our area this appears to be the age that most producers elect for moderate service. A slight difference in this observation is in the period of 2009-2013 in which 21-24 month old bulls were numerous. Two factors are represented in this increase as previously stated some producers want “2 year olds” and one farm presented a large number in this age category for presale examination. Across all time periods lower numbers of bulls were presented after age 5 years. Various factors contribute to this decline: avoidance of inbreeding, need for genetic change and musculoskeletal problems. However; in the two most recent time periods several 4-5 year olds remained in herds. The retention of these older bulls probably reflects owners desire to get one more season of genetics from these bulls.

The percent of bulls classified as satisfactory (Table 4) appears to have improved slightly over time with time period 2006-2008 having the best percent satisfactory, while the unsatisfactory percent is lowest for the same period of 2006-2008. Percent deferred did not change between the first two time periods but is slightly lower in the period 2009-2013. Since fewer bulls were deferred during period 2009-2013 they were likely placed in the unsatisfactory category therefore increasing the number unsatisfactory over time period 2006-2008. When unsatisfactory and deferred classifications are combined period 1993-1995 is higher than the other two periods which are only slightly different from each other. A reason speculated for the higher number of unsatisfactory and deferred in the first time period is the higher standards required by the new form which was introduced at that time. Another positive speculation is that the quality of bulls presented improved over time.

The percentages of satisfactory, unsatisfactory, deferred and combined unsatisfactory and deferred vs age are presented in Tables 5,6,7 and 8. The percent satisfactory is lowest for all time periods in older bulls in period 1993-1995 that group of bulls also represents the highest unsatisfactory classification. A possible reason for this observation is in 1993-1995 there were a group of bulls in herds being used that were in the questionable category under the old system. Interestingly in the more recent time periods bulls over two years of age had the highest satisfactory classification. Most of these bulls represent bulls that had been in herds for an extended amount of time and had been examined annually since entering the herd. As expected the highest percent deferred across all time periods (Table 7) are the younger bulls. Most of the deferred classification in these bulls was due to immaturity. When unsatisfactory and deferred classifications are combined (Table 8) in time period 1993-1995 the young bulls and older bulls performed the worst. However; in the more recent time periods the younger bulls were more likely to be in the unsatisfactory and deferred classification. The explanation for this change was stated earlier after the initial examination and bulls have entered herds they are evaluated on a once a year protocol with the satisfactory bulls remaining and frequently presented the following year.

When reasons for unsatisfactory and deferred classifications (Table 9) are examined it appears that physical problems were not very different in the first two time periods but improved slightly in period 2009-2013. Insufficient scrotal circumference improved from the first time period to the second but became an issue again in the most recent period. Bulls with insufficient scrotal circumference and unacceptable morphology improved in the two more recent time periods over time period 1993-1995. Unacceptable morphology as an unsatisfactory or deferred reason exceeds all other reasons for every time period and appears to be higher for the time period 2009-2013. Physical problems combined with morphology improved in the most recent time period. No real differences for motility and morphology as a reason was see between the three time periods. When reasons were combined (Table 10) physical problems were greatest in time period 2006-2008. Insufficient scrotal circumference was highest in the first period with great improvement in period 2006-2008, however; insufficient scrotal circumference became an issue again in period 2009-2013. Unacceptable morphology was by far the greatest reason for unsatisfactory or deferred classification for all time periods. Poor motility as a reason was slightly higher for the period 2006-2008.

Bulls of all ages presented with insufficient scrotal circumference (table 11) improved for period 2006-2008 but unfortunately was not different between 1993-1995 and 2009-2013.v When insufficient scrotal circumference is examined by the most prevalent breeds (Table 12) it is obvious all breeds were making improvement until the Angus and Brangus breeds lost some progress in the last time period. Most breeders have realized the importance of scrotal circumference and have made progress. However; with Angus and Brangus due to the demand for bulls in our area breeders have not been as selective as they were in 2006-2008. The age at which insufficient scrotal circumference was detected (Table 13) for the time period 2009-2013 is in the younger bulls usually when they are present for their first examination. The age group >21</=24 months may be over represented as one farm presented a large group of bulls presale in that age group for their first evaluation.

When the results for 2009-2013 were examined by the most prevalent breeds (Table 14) there were no differences in physical problems among breeds. Brangus were more likely to have insufficient scrotal circumference. Brangus were also more likely to have unacceptable morphology while there were no differences among the other breeds. No differences were apparent among any of the breeds for motility. There was only one breed that was different for final classification and that was Brangus. The Brangus breed was classified satisfactory only 50.5% of examinations. A possible explanation for this poor performance has been stated earlier in that the demand for bulls of this breed is growing in our area and the breeders of these bulls have softened on selectivity.

Suggested reading

1. Carson R, Wenzel J: Observations using the new bull-breeding soundness evaluation forms in young and adult bulls. Vet Clin North Am Food Anim Pract 1997; 13:305-311.
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