

THE BULL'S SCROTUM AND TESTICLES

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The Purpose of The Scrotum (Temperature Control): The testicles have two functions: (1) producing *spermatozoa*, and (2) producing the hormone, *testosterone*. The testicles are located outside of the body cavity in the scrotum. This is essential for normal sperm formation which occurs at a temperature several degrees below normal body temperature. The scrotum is important for thermoregulation of the testicles. This is done by means of a temperature sensitive layer of muscle (cremaster muscle) located in the wall of the scrotum which relaxes when hot and contracts when cold. Relaxation increases the relative length of the scrotum, thus moving the testicles away from body heat, In cold weather, the scrotum shortens and the testicles are held close to the warm body.

Scrotal/Testicle Shape: A common cause of low fertility in bull is abnormal testicle and scrotal sac development. The testicles should be symmetrical, nearly the same size, and freely movable in the scrotum. Small size or degeneration often affects one testicle only and is a serious finding.

There are three basic shapes in beef bulls. These are the "*normal*" or "*bottle-shaped*" scrotum, "*straight-sided*" scrotum, and "*wedge-shaped*" scrotum. Bulls having a normal scrotum with a distinct neck generally have the best testicular development. The normal scrotum offers the best opportunity for temperature control of the testicles. Often bulls with straight-sided scrotums are only moderate in testicle size. The straight-sided neck of the scrotum is generally the result of fat deposits that may impair proper thermoregulation. As bulls mature and lose condition, they will often develop a more normal scrotum. Wedge-shaped scrotums are pointed toward the bottom and hold the testicles close to the body wall. Bulls with this scrotal configuration have undersized testicles and seldom produce semen of adequate quality.

Consistency Of The Testicle The consistency of the normal testicle is much like a firm rubber ball. Extremely hard testicles indicate infection (orchitis) and very soft ones indicate degeneration. The epididymides, the structure that surrounds the testicles and transports semen to the accessory sex glands can be palpated. Defects of this structure seriously affect fertility. The neck or upper part of the scrotum can be examined. Intestine will be found in the upper part of the scrotum if a severe inguinal hernia is present. This is most common on the left side. Sometimes large fat deposits in the upper part of the scrotum can resemble an inguinal hernia.

Scrotal Circumference: Testicular size or the amount of sperm producing tissue is estimated through the use of scrotal circumference. Scrotal circumference is an accurate and highly repeatable measurement when obtained by use of a flexible centimeter tape slipped over the bottom of the scrotum and pulled snugly to the point of greatest diameter of the scrotal sac with the testes fully descended. Testicles that are not fully descended may have wrinkles in the scrotum that will inflate the measurement. It is important to get the testicles descended in cool weather (below 50°F) if accurate results are to be obtained. If below 32°F, bulls should be

evaluated in a warmer environment. The thumb and finger of one hand are placed on the side of the scrotum cradling the testes rather than grasping either the front or back or neck of the scrotum.

Table 1. Minimum scrotal circumference in centimeters^a.

Age	Angus Charolais	Hereford	Limousin
<i>months</i>	Simmental	Maine Anjou	Shorthorn
			Blonde d'Aquitane
12-14	33	32	31
15-20	35	34	33
21-30	36	35	34
<30	37	36	35

^aCoulter, G.H. 1991. International Beef Symposium, Great Falls, MT.

Effects Of Age on Scrotal Circumference: Bull age has the greatest effect on testicular development in young bulls from 6 to 36 months of age. There is rapid testicular growth in young bulls (6 through 16 months of age) and tremendous range in testes size for bulls of the same age within breed. Thus scrotal growth is curvilinear (goes up fast and then flattens out) rather than linear (a straight line). Scrotal circumference increases from 2 to 3 centimeters between one and two years of age for most breeds. Colorado data suggests a value of 0.026 centimeter per day for an adjustment factor. The following formula is suggested by Canadian researchers:

$$Y0 = Y1 - 0.2541(X1-X0) + 0.0002976(X1^2-X0^2)$$

Y0 = Adjusted SC (centimeters)

Y1 = Actual SC when measured (centimeters)

X0 = This usually 365 (days), if adjusting to yearling age

X1 = Actual age in days when measured

Table 2. Age of dam adjustment for yearling beef bulls (Bos taurus)

<u>Age of Dam</u>	<u>Adjustment factor</u>
5-yr or older	+0.0 cm
4-yr-old	+0.4 cm (.1) ^a
3-yr-old	+0.8 cm (.2)
2-yr-old	+1.3 cm (.8)

Age of dam adjustments should be added to the SC only after SC has been adjusted to 365 days of age.

^aAdjustment factors depend on whose you choose to use, another set of suggested values.

Heritability of Scrotal Circumference: Published estimates of heritability of SC in yearling bulls range from .4 to .7. The following are estimates by breed:

Table 3. Heritability estimate for scrotal circumference of one-and two-year-old beef bulls of different breeds^a.

Angus	0.22±0.20 (205) ^b	0.00±0.21 (270)
Charolais	0.46±0.14 (364)	0.60±0.25 (232)
Hereford (horned)	0.89±0.17 (415)	0.57±0.07 (1037)
Hereford (polled)	0.94±0.26 (218)	0.65±0.10 (692)
Limousin	0.94±0.29 (98)	-
Maine-Anjou	0.59±0.22 (145)	-
Shorthorn	1.01±0.31 (88)	0.69±0.34 (89)
Simmental	0.63±0.19 (244)	0.20±0.24 (257)

^aCoulter et al. (1987). Can. J. Anim. Sci. 67:645.

Effects of Double Muscling on Scrotal Circumference: Double-muscling in beef bulls results in reduced testicular development.

Table 4. Scrotal Circumference: Normal versus double-muscled bulls^a.

		Normal	Double-Muscle
Year 1	Number of Bulls	100	50
	Scrotal Circumference, cm	35.1±.3	32.1±.3
Year 2	Number of Bulls	96	84
	Scrotal Circumference	35.7±.2	32.7±.3

^aMichaux and Hanset. 1981. Sonderdruck aus Zeitschrift fur Tierzuchtung und Zuchtungsbiologie 98:29.

How Much Scrotal Circumference is Enough?: In one study, the probability of a beef bull having satisfactory seminal quality increases until about a scrotal circumference of 38 cm.

Scrotal Circumference and Male Fertility: There is a high correlation (.81) between scrotal circumference and sperm output. In yearling bulls, researchers have observed that as scrotal circumference increase, motility, percent normal sperm, volume, sperm concentration, and that sperm output increase, and percent abnormalities decrease. It has been estimated that for every 1 centimeter increase of a sire's scrotal circumference over the population average, one can expect a 0.25 increase in scrotal circumference in male offspring.

Scrotal Circumference and Female Fertility Traits: Scrotal circumference is highly correlated with age at puberty in half-sibling heifers. Heritability estimates for female reproductive traits are generally low, while heritability estimates of testicular traits are moderate to high. It has been estimated that for every 1 centimeter increase of a sire's scrotal circumference over the population average, one can expect a 4 day decrease in the age at onset of puberty in heifer offspring. The variation of one centimeter increase in testicular circumference on reduction in age at puberty has been from 0.75 to 10 days. It is well accepted that sires with above average scrotal circumference should produce female offspring that reach puberty sooner and have greater lifetime reproductive potential.