

American International Charolais Association

CHAROLAIS UDDER QUALITY

GENETIC EVALUATION

RESEARCH REPORT

At the October 24, 2018, AICA Breed Improvement Committee Meeting, Sally Northcutt, Method Genetics, presented an update on AICA Udder Score Research. This report is being published as indicated by action taken by the committee.

Few may be aware, but in the last 10 years, the Charolais breeders have amassed a sizable udder score database. The American International Charolais Association's Whole Herd Rewards (WHR) process has been a contributing factor in capturing these valuable cowherd records.

Udder soundness is a major factor in determining cow longevity. Poor udder quality can contribute to calf mortality, increased labor requirements, and more frequent animal handling. The purpose of the following research report is to estimate the genetic parameters for udder traits and to summarize research-based expected progeny differences for udder suspension and teat size.

UDDER SCORE REPORTING

Individual udder suspension and teat size scores are reported by Charolais breeders to the American International Charolais Association (AICA) using an nine-point scoring system as recommended in the Beef Improvement Federation Guidelines (9th edition, March 2018).

The AICA reported udder score is a two-digit code in which the first digit is associated with suspension and the second digit represents teat size. These scores are assigned by breeders to individual females, preferably by the same person on the weakest quarter at or near a 24- hour window of calving. Udder suspension scores are assigned ranging from a numeric 9 (very tight) to 1 (very pendulous). The teat size scores range from 9 (very small) to 1 (very large). The AICA udder scores are submitted either online or by printed forms for the AICA Registration Form & Weaning Worksheet.

Figure 1 summarizes the scoring system. Figure 2 illustrates the AICA data entry form for reporting udder scores.

Figure 1. AICA udder suspension and teat size scoring system.

Suspension		Teat Size	
9	Very tight, level	9	Very small
8		8	
7	Tight, fairly level	7	Small
6		6	
5	Moderately tight	5	Intermediate
4		4	
3	Pendulous, broken floor	3	Large
2		2	
1	Very pendulous, broken floor	1	Very large, balloon shape

Figure 2. Example form for AICA udder score data entry by breeders.

CALVING						WEANING				STATUS CODES					
HB LOC	BIRTHDATE MDY	SEX	TWIN CODE	CALVING FASE	BIRTH W/Lbs	UDDER SCORE	WNG DATE MDY	WNG W/Lbs	MGT CODE	PAST	WEIGH DATE MDY	WT/Lbs	BCS	CALF DISP	DAM DISP
<i>Is not named will not be registered</i>															
LE	1/1/01	F		1	79	65	6/15/01	650	J	A	6/15/01	1240	6		
A Calf 0001 Pld								1	P	W/L					

Weaning Management Codes

- 1 Dam only - non creep fed
- 2 Dam plus creep feeding (6 weeks or longer)
- 3 Irregulars - no ratio (e.g. twins)
- 4 Embryo transfer

SVC Type

- N Natural service
- A In herd AI (own sire)
- O Out of herd AI (do not own sire)
- E Embryo transplant

Calving Score

- 1 No difficulty
- 2 Minor difficulty
- 3 Major difficulty
- 4 Caesarean section
- 5 Abnormal presentation
- 6 Stillbirth

Class Codes

- 1 Purebred
- 2 Full French
- 3 American French
- 4 Verified polled
- 5 Red Charolais
- 6 Cross recordation
- 7 Charbray
- 8 Charbray cross

Horn Status

- P Polled
- S Scurs
- H Horned
- D Dehorned

Body Color

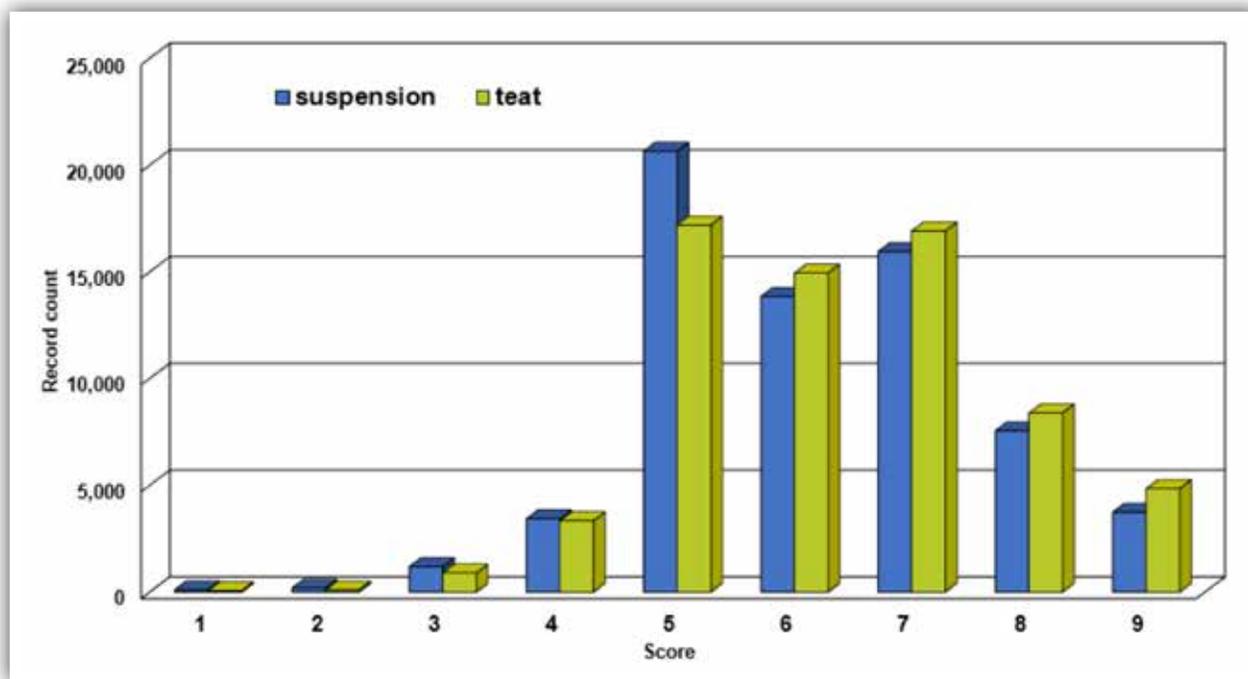
- W White
- L Light cream
- C Dark cream

Dam's Udder Score

Udder score is a two-digit code in which the first digit represents the udder's suspension and the second digit denotes the size of the teats. Dams' udders should be scored at calving. Record the two-digit code by using the following system:

<p>Suspension</p> <ul style="list-style-type: none"> 9 Very tight, level 8 7 Tight, fairly level 6 5 Moderatley tight 4 3 Pendulous, broken floor 2 1 Very pendulous, broken floor 	<p>Teat Size</p> <ul style="list-style-type: none"> 9 Very small 8 7 Small 6 5 Intermediate 4 3 Large 2 1 Very large, balloon shape
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Figure 3. AICA distribution of udder suspension and teat scores.



PERFORMANCE RECORDS AND GENETIC PARAMETER ESTIMATES

Charolais breeders have collected over 84,000 individual udder suspension and teat size scores. For the current report dataset, average phenotypic means were 6.1 for udder suspension and 6.3 for teat size based on the 1 to 9 system.

The AICA udder performance records were edited for contemporary group size, pedigree completeness, and scoring system errors. The edited dataset of 66,653 scores represented 31,114 females, since breeders collected repeated records on individuals over time. Figure 3 depicts the distribution of scores for the udder and teat traits.

Udder traits were analyzed in a multi-trait animal model genetic evaluation with repeated udder score records. As an overview, the mathematical model accounted for the age of the female measured, contemporary group differences, and permanent environment effects for multiple scores on females. Variance component analysis produced heritability estimates of .25 and .23 for udder suspension and teat size. These two traits were highly correlated, with a

.90 genetic correlation. The high genetic correlation indicates these two traits are somewhat controlled by the same genes.

Known to be moderately heritable, udder quality genetic parameters have been quantified and breeding values published as expected progeny differences (EPDs) for the American Hereford Association animals. Bradford et al. (2015; J. Anim. Sci. 2015.93:2663) reported heritability estimates of .32 and .28 for udder suspension and teat size, respectively. The genetic correlation was reported to be .81 in the Hereford data.

GENETIC EVALUATION FOR UDDER QUALITY TRAITS IN CHAROLAIS

Once the AICA udder suspension and teat size genetic parameters were estimated, the national cattle evaluation procedures were constructed based upon the previously described multi-trait animal model. Over 75,000 EPDs were produced from the genetic evaluation using the edited udder score dataset and a three-generation pedigree. Animal genotypes were not included in the research evaluation. Table 1 presents the descriptive statistics for the suspension and teat size EPDs and accuracy.

Table 1. AICA Descriptive statistics for Charolais Udder Suspension and Teat Size EPDs.

EPDs in score units	Mean	SD	Minimum	Maximum
Suspension EPD	1.10	.16	-.26	2.14
Teat Size EPD	1.09	.15	-.20	2.09
Accuracy	.18	.13	0	.90

Figure 4. Example of two Charolais sires with udder trait EPDs.

	Suspension EPD	Teat EPD
Sire A:	1.00	0.90
Sire B:	0.50	0.45
Score Difference	0.50	0.45

Figure 5. AICA Charolais Udder Suspension and Teat Size Genetic Trend.

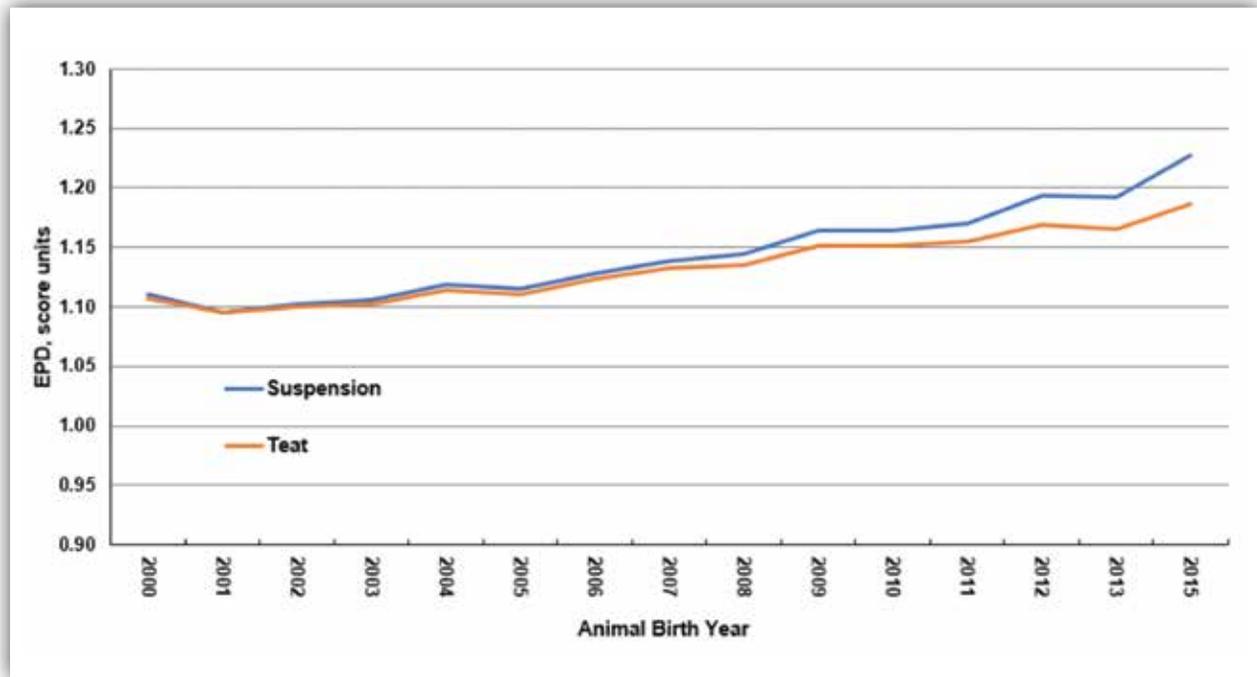


Figure 4 illustrates the hypothetical comparison of two sires with udder trait EPDs. Assuming both sires have similar accuracies, Sire A would be expected to have daughters with more favorable udder suspension and teat size at calving than daughters of Sire B. The magnitude of difference between the two sets of future daughters' expected scores would be about a half score favoring Sire A, based upon the nine-point scoring system.

Much of the udder score reporting by Charolais breeders has occurred since 2005, as submitted in their performance weaning worksheets. With the sizeable udder database, reasonable genetic parameters, and a research genetic evaluation to create EPDs, a snapshot of the genetic trend for udder traits was prepared. Figure 5 depicts the genetic trend for the two trait EPDs. The lines are derived by plotting the average

EPD by animal birth year. While not extreme, the trend lines illustrate a favorable improvement in the average genetic prediction in more recent birth years.

Through performance record reporting by AICA breeders, a large dataset of udder suspension and teat scores were available to estimate genetic parameters and generate selection tools for traits not readily accessible in many beef cattle breeds. The efforts by AICA to provide this research resource further generates interest in Charolais cow traits as well as accessibility to future selection tools for seedstock and commercial beef producers.

The research report and an accompanying standalone spreadsheet listing of suspension and teat size EPDs for sires born since 1990 with a minimum of 25 daughters can be viewed at www.charolaisusa.com; click on the Genetics tab on the homepage; click on Genetic Evaluation and view under Links.

