ABSTRACT: Two groups of feedlot cattle on two different mineral supplement trials were used to assess the relationship between temperament and cannon bone measurements. The cannon bones of approximately fourteen month old crossbred Bos taurus European, Continental, and British steers (n = 135), primarily Angus, Charolais, and Hereford breeds, and 54 Charolais x Hereford heifers were measured postmortem. Postmortem measurements were taken on the left front 3rd and 4th fused metacarpal (cannon) bone. Length (middle peak of the base to the sagittal ridge) was measured with an Absolute Digimatic caliper (Mitutoyo Corp., Japan) CD-12" CP, while width (lateral to medial), and thickness (cranial to caudal) measurements were taken with an Absolute Digimatic caliper model CD-8" CS. Steers were individually scored on speed of exit from the squeeze chute after physical restraint; 1 = walked, 2= trotted, and 3 = ran out of the chute. Heifers were scored on their reluctance to place their head in the head restraint: 1 = not reluctant and 2 = reluctant. Steer cannon bone thickness (P = 0.008) and width (P < 0.001) were related to the speed of exit from the chute. Steers with thicker and wider bones exited the chute at a slower pace than those with smaller cannon bones. Heifers with wider (P = 0.07) and thicker (P = 0.06) bones tended to be less likely to balk at the head restraint. Cattle with larger cannon bones were calmer than those with smaller bones. Use of physical indicators such as cannon bone size may assist producers in predicting individual cattle temperament.

Introduction

The livestock industry uses physical markers on individual animals to predict qualities such as temperament and reproductive success. Common physical markers used in the cattle industry are facial hair whorl position and scrotal circumference. Facial hair whorl position has been shown to be an indicator of individual cattle temperament measured as activity level during restraint in a squeeze chute (Grandin et al., 1995), willingness to approach a novel person (Randle, 1998) and activity level in a novel environment (Lanier et al., 2001). Grandin et al. (1995) and Lanier et al. (2001) demonstrated an association between having a facial hair whorl above eye level and having a more nervous or flighty temperament than those with lower facial hair whorls. Randle (1998) observed that cattle with facial whorls at eye level were the most curious of novel people. Scrotal circumference has been shown to be associated with reproductive potential in bulls and onset of heifer puberty. The greater the scrotal circumference the greater the potential to be a
viable breeding bull (Ott, 1986; Coe 1993), as well as producing heifers who reach puberty earlier than those from bulls with smaller scrotal circumference (Smith et al., 1989).

Materials and Methods

Animals. One hundred thirty-five crossbred Bos taurus steers, primarily Angus, Charolais and Hereford breeds, and 54 Charolais x Hereford heifers were used to assess the relationship between temperament and cannon bone measurements (length, width, and thickness). Steer and heifer age was approximately 14 months.

Steers and heifers were involved in two separate studies at two different locations. Temperament variables assessed differed between the studies due to facility design constraints. Temperament was assessed by exit speed from the squeeze chute in steers, and heifer reluctance to place their head in the head restraint. Exit speed was ranked as 1 = walked, 2 = trotted, and 3 = ran out of the chute. Heifers were scored as 1 = not reluctant and 2 = reluctant to enter head restraint.

Postmortem measurements were taken on the left front 3rd and 4th fused metacarpal (cannon) bone. Length (middle peak of the base to the sagittal ridge) was measured with an Absolute Digimatic caliper model CD-12" CP, while width (lateral to medial), and thickness (cranial to caudal) measurements were taken with an Absolute Digital caliper model CD-8" CS.

Statistical Analysis. Average bone measurements were compared as dependent variables by the heifer temperament variable (balked at head gate, did not balk) using a two-tailed t-test in SAS proc t-test (SAS, 1999-2000). When F-test for quality of variance was significant, the unequal variances t-test was used. Otherwise, the pooled variance t-test was used. Steer temperament variable (exit score) was analyzed as a dependent variable in a one-way ANOVA (SAS, 1999-2000) with cannon bone measurements as the independent variable.

Results

Steer cannon bone thickness (P = 0.008) and width (P < 0.001) were related to the speed of exit from the squeeze chute. Steers with thicker and wider bones exited the chute at a walk, while those that trotted or ran out of the chute had thinner and narrower cannon bones (Table 1). Heifers with wider (P = 0.07) and thicker (P = 0.06) bones tended to be less likely to balk at the head restraint (Table 1). Both steers and heifers with larger cannon bones were calmer than those with smaller bones. Other indicators of temperament (i.e. activity level in the squeeze chute, entry speed into the chute, and hesitation to enter the chute) were measured, but were not significantly associated with cannon bone measurements.

Table 1. Association between temperament of steers and Heifers and postmortem cannon bone measurements*
### Cannon bone measurements in mm

<table>
<thead>
<tr>
<th>Temperament</th>
<th>Length mean (s.e.m.)</th>
<th>Width mean (s.e.m.)</th>
<th>Thickness mean (s.e.m.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steers</td>
<td>P = 0.71</td>
<td>P &lt; 0.001</td>
<td>P = 0.03</td>
</tr>
<tr>
<td>Walked out</td>
<td>216.92 (1.63)</td>
<td>45.16 (0.47)</td>
<td>28.22 (0.32)</td>
</tr>
<tr>
<td>Trotted out</td>
<td>216.42 (0.98)</td>
<td>43.89 (0.28)</td>
<td>27.55 (0.19)</td>
</tr>
<tr>
<td>Ran out</td>
<td>214.6 (2.35)</td>
<td>41.52 (0.67)</td>
<td>26.76 (0.46)</td>
</tr>
<tr>
<td>Heifers</td>
<td>P = 0.90</td>
<td>P = 0.07</td>
<td>P = 0.06</td>
</tr>
<tr>
<td>Balked</td>
<td>196.24 (24.82)</td>
<td>36.09 (4.55)</td>
<td>23.62 (2.99)</td>
</tr>
<tr>
<td>Did not balk</td>
<td>199.69 (8.15)</td>
<td>40.05 (0.36)</td>
<td>26.24 (0.17)</td>
</tr>
</tbody>
</table>

*p-value (Ho: Bone size means between temperament variables are equal)*

**Discussion**

Participants in the livestock industry are interested in increasing productivity while lowering production costs. Cattle producers are no exception, and have recently begun to utilize physical indicators of temperament and performance in order to better achieve their goals. The utilization of physical indicators that are easily observed, such as hair whorls, scrotal circumference, and cannon bone size, may be useful tools for producers in making management and breeding decisions.

**Literature Cited**


