

# A Preliminary Report on a Laminitis-Like Condition Occurring in Bulls Under Feeding Trials

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## Introduction

Each year over three hundred bulls enter the Saskatoon Feed testing station and each year about forty percent of the group meet the standards set for food conversion, back fat thickness and testicular circumference. Of these successful bulls up to twenty five percent are rejected by "evaluators" on the basis of unsound conformation. In October of 1985 we were asked to evaluate the "feet and legs" of bulls undergoing feeding trials.

Our assignment, therefore, was to define, in objective terms the reasons for the culling.

Because it had been suggested that poor limb and hoof conformation was likely to be an important consideration our initial efforts were directed towards developing a system for measuring the conformation of the bulls under trial.

## Materials and Methods

Three hundred and twenty-four bulls from six breeds all born in 1985 entered the Saskatchewan R.O.P. station in November 1985. After one week of acclimatization they were placed on ad lib feeding. The ration consisted of barley silage fed at a ratio of 3.75 to 3.2 lbs of silage to 1 lb of concentrate mix. The ration on a dry matter basis had 50% roughage and 50% concentrate. The formulation contained 15.5% protein on a dry matter basis from Oct. 31 and 13.5% protein from Jan. 1 to March 25.

A data collection system developed by Mills (Mills et al. 1986) was modified to our "clindat system" which would be suitable for computer analysis. All of the bulls were marked at selected anatomical points and photographed. The transparencies produced were projected onto a digitization pad, the data was fed directly into the computer and processed. The results of this analysis will be reported at a later date.

On March the 27th, 1986, 141 bulls that had met the standards described above were examined by two individuals who had considerable experience in judging the conformation of beef cattle.

The evaluators rejected 22 bulls of which 2 had clear

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conformational defects, 2 were lame because of injury and one appeared to have epiphysitis.

## Findings

The evaluators justified their decisions in terms of conformational deficiency. It was our opinion that all of the deficiencies described as being defects in conformation were, aberrations of gait. These aberrations of gait were indistinguishable from those associated with laminitis in cattle. The following are our observations:

1. Three animals carried one or both limbs well under the body i.e. Camped under or "protracted the limb" (evaluators comment - sickle hock).
2. Two animals bore weight only on the outer hind claw (evaluators comment- bow legged).
3. Three animals extended the fore limbs unusually far forward "protraction of the limb" (evaluators comment - needed hoof trim).
4. Five animals "knuckled at the pastern" (maintained flexion of the metatarso-phalangeal joint throughout weight-bearing) of the hind limb. This appeared to be a distinct effort to avoid bearing weight on the heels (evaluator comment - bad on the hind feet).
5. The remaining animals had a "stilted" gait.

Aberdeen Angus bulls were much less troubled by hoof problems than were the other breeds. Black horn is considered by many to have qualities superior to that of light colored horn.

An analysis of the data revealed the following:—

- i) of 33 charolais 12% (4) were rejected for aberration of gait,
- ii) of 39 herefords 10% (4) were rejected for aberration of gait,
- iii) of 23 simmentals 21% (5) were rejected for aberration of gait,

Our observations confirmed those of the lay evaluators in respect to those animals that they had rejected. However, we observed twenty other animals showing suspicious aberrations of gait but to a lesser degree than the rejected bulls.

Although 22 animals were rejected on "feet and legs" only three laminitic animals were slaughtered, the remainder were returned to the owner presumably for private sale. However, of the original 324 bulls we were able to examine the hind

TABLE 1.

Breed	(Total)	Width of band at dorsal surface (av)	Width of band at abaxial groove (av)
Angus	(13)	2.53 cm	3.3 cm
Charolais	( 9)	2.88	3.93*
Hereford	(17)	2.59	3.67
Shorthorn	( 3)	2.83	4.00
Simmental	(18)	2.73	3.71
Maine-Anjou	( 2)	2.75	3.95

\*Three of the specimens did not show check line/band.

TABLE 2. Number of hemorrhages observed in individual claws of 65 bulls.

Breed	(Total)	None		1		2		3	
		Med	Lat	Med	Lat	Med	Lat	Med	Lat
Angus	13	11	12	1	0	1	1	0	0
Charolais	12	2	3	5	4	5	3	0	2
Hereford	17	2	2	6	5	7	9	2	1
Maine-Anjou	2	0	0	1	2	1	0	0	0
Shorthorn	3	1	1	2	2	0	0	0	0
Simmental	18	0	0	7	6	8	10	3	2

hooves of a total of 65 bulls. The following was observed in the specimens examined:—

1. *Check Lines*—92% incidence. We are defining a check line as a groove running more or less parallel to the coronary band.
2. *Check Bands*—92% incidence. We are defining a check band as the region between the check line and the coronary band (or another check line) that differs in texture from the horn of the distal extremity of the hoof.
3. *Hemorrhages of the wall and sole*. Numerous hemorrhages were observed in the walls of the hooves of the bulls. We classified the hemorrhages into three groups on the basis of appearance.

Group One—Discrete. An area of red discoloration of the wall of the hoof that does not exceed 1 cm in diameter.

Group Two—Diffuse. An area of pinkish tinge affecting an ill defined area.

Group Three—Linear. Similar in width and appearance to the discrete hemorrhage but extending as a band several centimeters long running parallel to the coronary band.

The data set down in Table II demonstrates a trend which may or may not be repeatable. Most conveniently the findings may be summarized in the following manner.

88.50% of the claws of 13 angus bulls showed no hemorrhages  
 21.00% of the claws of 12 charolais bulls showed no hemorrhages  
 11.75% of the claws of 17 hereford bulls showed no hemorrhages  
 0.00% of the claws of 2 maine-anjou bulls showed no hemorrhages  
 33.00% of the claws of 3 shorthorn bulls showed no hemorrhages  
 0.00% of the claws of 18 simmental bulls showed no hemorrhages

Two additional groups of purebred bulls were on feed

TABLE 3.

Year	Total Bull Herd	Total Culls	Lameness Culls
1982	1456	355	72
1981	1541	361	80
1980	1772	375	90
1979	1692	306	81
1978	1573	327	68

trials. The feeding was identical to the R.O.P. bulls with the exception that in one group oats were used and in the other barley.

2.50% of the claws of 20 purebred bulls fed oats showed no hemorrhage  
 5.25% of the claws of 19 purebred bulls fed barley showed no hemorrhage

As a control we harvested the claws of 14 cross-bred bulls and 14 cross-bred steers. These animals had received creep feed prior to weaning and were fed a ration that was initially lower in energy than the R.O.P. bulls but approximately comparable in protein content. Significantly less silage was fed throughout the feeding period. The detailed ration changes were approximately as follows.

Sep. 24/85 80% silage 15.0% Barley 5% Canola\*  
 Oct. 31/85 50% silage 35.0% Barley 5% Canola 10.0% hay  
 Jan. 3/86 27.5% Barley 15% Canola 57.5% hay  
 Feb. 21/86 60.0% Barley 10% Canola 5.0% Hay 25% straw  
 Feb. 24/86 70.0% Barley 5% Canola 5% Hay 20% Straw

\*canola = rape

The claws of the controls showed the following:

85.75% of 14 cross-bred steers showed no hemorrhages  
 68.00% of 14 cross-bred bulls showed no hemorrhages

4. *Erythema and edema of the coronet or peri-coronal epidermis*. Usually the discoloration of these areas is pink but occasionally they take on a blue, cyanotic appearance, this phenomenon was observed in some of the living animals.

We were unable to produce any evidence regarding histological changes in the corium of the digits examined. A section of the hoof taken through the areas of hemorrhage showed that the bleeding had taken place into the substance of the horn. The hemorrhages in the wall sloped diagonally through the wall from a point of origin at the corium distally through the stratum medium to the stratum externum. Similar sections through the sole showed that hemorrhages had occurred at intervals giving an appearance similar to the rings in a tree. We also noted that the lines of hemorrhage that occurred in the bearing surface of the heel merged with the areas of erosion that occurred in the heels of some of the animals.

#### *Economic Significance of Findings*

It is our opinion that the majority of the bulls that were culled for conformational defects had no such defects but were affected with laminitis. Most veterinary texts indicate that an animal that has once been affected with laminitis will be susceptible to a recurrence of the condition. The

Saskatoon bull testing station is one of several in Canada all of which feed rations comparable to that used in Saskatoon. There has been no indication that a laminitis like condition has been observed in any other Canadian bull testing station. The possibility that the phenomenon might be observed in other feeding stations is at least tenable on the grounds that the feeding regimen is comparable.

The animals passing through the Register of Performance (R.O.P.) stations represent a substantial part of Canada's genetic pool. If locomotory unsoundness were to be a significant problem in this genetic pool significant economic losses would be involved.

The practice of "fitting" young bulls for bull sales is widespread. This practice involves intensive feeding in order to achieve heavy weight gains by the time the animal enters the second year of its life. Many of these heavy young bulls find their way into community pastures. (These are areas set aside for the benefit of ranchers who send cattle there in the spring hopefully to retrieve them pregnant in the fall).

Figures on the number of bulls disposed of, from community pastures in Saskatchewan, over a five year period due to foot and leg problems are available. The problems do not include injury, footrot or corns, but do include deformities that may be inherited.

The rate of attrition due to lameness seems to be high. The relationship between the practice of "fitting" young bulls for bulls sales with a high incidence of lameness in later life has not been studied.

#### *Discussion*

The presence of check lines and check bands has been reported in the literature (Peterse, 1980). In our current study it seems that the check line was formed either at the time the animal was introduced to feed or at the time of weaning. In future studies we propose to evaluate the weaning protocol in order to investigate possible correlations between the techniques employed and the severity of the check line/band. The data recorded in Table I, we believe, indicates that in a period of approximately 140 days the average growth of horn on the dorsal surface of the hoof was approximately 2.75 cm (5.8 mm/month) and at the abaxial groove 3.75 cm (8.12 mm/month). These figures suggest that the rate of horn production may be greater in this sample of animals than has been previously regarded as normal for adult animals.

The R.O.P. bulls, plus the thirty-nine additional bulls on independent feed trials were all fed rations containing a large amount of silage. These animals all showed hemorrhages. The group of bulls and steers that were fed much less silage were also less troubled by hemorrhages. It is interesting to note that good quality silage contains high levels of lactic acid. We could postulate that if at the same time a high energy ration was fed the levels of lactic acid could become dangerously high. The currently accepted theory concerning the etiology of laminitis suggests that lactic acidosis plays an

important role.

Our subjective evaluation of the aberrations of gait that we observed suggested to us that the clinical manifestation of laminitis in cattle can be more complex than it is in the horse. The phenomenon of knuckling at the fetlock was particularly interesting because in each case the animal failed to bear its full weight on the heel suggesting that pain was present. We have observed laminitis occurring in one claw on several occasions. In this study it appeared that several animals were bearing more weight on a lateral than medial claw giving the bow legged appearance noted by the evaluators.

The number of hemorrhages observed in the claws of the limbs examined, we believe, is likely to be significant. The hemorrhages must be a historical record of an event that took place some weeks or months prior to slaughter. Our reasoning is that the hemorrhages occur in layers between apparently normal horn. Logically, therefore neither the hemorrhage nor the check line/band are obviously directly connected with the aberrations of gait. The bulls were maintained in corrals on soft bedding and the aberrations of gait were only apparent when the animals walked on a concrete roadway. The sole of all the hooves were thick in comparison to the hooves of other bulls and steers examined at random from slaughter house material. This could imply that the ration stimulated horn growth to such an extent that weight bearing was transferred from the wall to the center of the sole. This possible change of weight bearing may have been incidental in precipitating the clinical signs observed.

Our observation linking layers of hemorrhages with the lines of erosion of the heel we believe could be an important finding. The etiology of heel erosion has been difficult to substantiate but we suggest that our observation does establish the suspected relationship between laminitis and erosion.

#### **Conclusions**

The study of the conformation of 324 bulls at a R.O.P. station led to the observation of clinical signs indistinguishable from laminitis. Many of the observations made were unexpected. The sample size and experimental design cannot be considered adequate to permit definitive conclusions. Nevertheless, the observations made have raised a number of questions that warrant further study.

The information gathered will undoubtedly contribute to the development of a future experimental design. The current study occurred as a result of a fortuitous accident.

#### **References**

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