Disposition - Convenience Trait or Economically Important

Darrell Busby
Iowa State University Extension Specialist
ISU Armstrong Research Farm
Lewis, IA 51544
dbusby@iastate.edu
Tele 712.769.2600

Introduction

The disposition of cattle is a measure of the relative docility, wildness and handling ability of animals during processing both in the pen and handling facilities. As with most traits in beef production, part of the final product is inherited from the sire and dam and the other part is influenced by management and environment the animal is developed and exposed to.

Easily excitable animals compromise their own safety and the safety of stockpersons in charge of raising them. Producers have recognized the importance of temperament in successful management (Gauly et al., 2001).

Is the value of good disposition cattle only in less gas used in the 4 wheeler to move the cattle from one pasture to another? Or does the disposition or temperament of cattle impact feedlot gain, carcass quality and other economically important traits?

How does one measure disposition?

In the Tri-County Steer Carcass Futurity Program, we evaluate disposition 3 or 4 times while a steer or heifer is on feed. First evaluation is during the on-test weight – 28 to 35 days on feed. Second evaluation is at re-implanting – 70 to 100 days on feed. Third evaluation at sort for 1st harvest – 140 to 180 days on feed and approximately half of the cattle our disposition scored a 4th time 35 days later prior to the 2nd harvest date.

The Beef Improvement Federation scoring system is.

Disposition Score = 1 to 6 scoring system

1 = Docile. Mild disposition, gentle, and handles quietly. Exits chute calmly.

2 = Restless. Quieter than average, but maybe stubborn during processing. Some tail flicking. Exits the chute promptly.

3 = Nervous. Typical temperament is manageable, but nervous and impatient. Constant movement. Repeated pushing and pulling on headgate. Exits chute briskly.

4 = Flighty (wild). Jumpy and out of control, quivers and struggles violently. Continuous tail flicking. Frantically runs fence line and may jump when penned individually. Exhibits long flight distance and exits chute wildly.

5 = Aggressive. Similar to Score 4, but with added aggressive behavior, fearful, extreme agitation, continuous movement which may include jumping and

bellowing while in chute. Exits chute frantically and may exhibit attack behavior when handled alone.

6 = Very aggressive. Extremely aggressive temperament, “killers”. Pronounced attack behavior.

Australian work concluded temperament is highly repeatable and an animal’s temperament changes little over time (Petherick 2002).

Is disposition an important economic trait?

During the past 3 years, 13,315 calves fed at eight Southwest Iowa feedyards were used to evaluate the effect of disposition during the feedlot period on feedlot gain and carcass quality. The steers and heifers were consigned by cow calf producers, representing 12 states, including Georgia, South Carolina, Alabama, Florida, Virginia, Missouri, Indiana, Mississippi, Tennessee, Minnesota, Illinois and Iowa, were consigned to the Tri-County Steer Carcass Futurity program. The cattle were weighed upon arrival to the feedlot, after 28 to 35 days, at re-implant, and prior to harvest. A disposition score, using the Beef Improvement Federation six point scoring system – 1=very docile, 6=aggressive, was assigned at on test weighing, re-implant time, and pre-harvest. A common diet and health program was utilized at each feedlot. Calves were sorted and harvested when they were visually evaluated to have .40 to .45 inches of fat cover.

The six point system was condensed to three classifications for analysis – 1 and 2 = docile, 3 and 4 = restless, and 5 and 6 = aggressive.

Item	Docile	Restless	Aggressive
No of Head	9,791	2,954	785
% of Total	72.4%	21.8%	5.8%
Arrival Weight	631	626	611
Overall ADG	3.17 [a]	3.11 [b]	2.91 [c]
Feed to Gain	7.10 [a]	7.13 [a]	7.23 [b]
Morbidity Rate	19.2% [a]	16.8% [b]	16.2% [b]
Mortality Rate	1.09%	1.02%	1.91%
% Prime	1.7%	1.2%	0.1%
% Choice	72.4%	67.9%	58.1%
% Select	23.3%	27.5%	36.2%
% Standard	2.6%	3.4%	5.6%
% CAB ®	29.1%	22.8%	14.3%

[a,b,c] Values within a factor without a common superscript differ (P<.05).

Quality and yield grade have become increasingly important to the beef feeding industry over the last decade. Today's beef producer has to continually balance feedlot performance with payment premiums and discounts associated with grid-based marketing systems. While calmer cattle perform better in a feedlot environment, producers still need to consider how temperament could affect the United State's Department of Agriculture grading of a beef animal's carcass. Temperament's influence on cattle quality and yield grades is important to any producer marketing their cattle to fit grids that reward low yield grade and middle Choice or higher quality grade.

Research from the Tri-County Steer Futurity program showed significant trends between temperament and cattle reaching the upper two-thirds Choice or higher ($P < .0002$). More docile cattle are more likely to reach upper two-thirds Choice or higher quality grade than nervous to aggressive steers. The reverse effect was seen on the lower quality grades. Nervous to aggressive steers were more likely than docile cattle to reach the lower quality grades of Select and Standard. In the end, calmer steers achieved a higher mean average quality grade than cattle with more excitable temperaments (Busby, 2005).

Nervous or aggressive cattle produced more Yield Grade 1 & 2's (70% vs. 58%) than the docile cattle (Busby, 2005).

A greater percent of the docile cattle (19.2% vs. 16.2%) were treated than compared to the aggressive cattle. However, death loss was higher for the aggressive cattle (1.09% vs. 1.91%) when compared to the docile cattle. Why the differences in the morbidity and mortality? The Tri-County Steer Carcass Futurity feedlots use the DART assessment for bovine respiratory disease management; where DART stands for Depression, Appetite, Respiratory index and Temperature. Signs of depression are head lowered, ears dropped, eyes dulled and stimulation to move. When walking the pens looking for depressed calves the aggressive calves are most likely in the back of the pen head held high, ears up and eyes watching every move. One part of the appetite factor is evaluated by how the animal approaches the bunk as the feed truck drives by. The poor disposition cattle tend to stay away from the bunk until feed truck is out of sight. In other words, 2 of the 4 factors used to assess bovine respiratory disease are impacted by the disposition of the animal. Another factor of why less aggressive cattle are pulled but the death loss is higher is the question the feedlot manager is asking each time they pull an aggressive animal, will sorting the animal out of the pen, driving it to the treatment area, and administering treatment result in the animal responding to the treatment, the animal injuring itself or the worst case an animal handler being injured. From a feedlot standpoint, 2 points, 1 - avoid feeding cattle with poor dispositions, which may not be a viable option, 2 – discount the depression factor in the DART assessment guide.

When considering disposition effect on quality and yield grade, feedlot gain, death loss, and treatment costs, docile calves returned $62.19 more than aggressive calves. Calves with poor disposition were lighter upon arrival at the feedlot, gained less, had higher mortality rates, reduced quality grade, and reduced CAB® acceptance rates compared to docile calves.

The above analysis agrees with earlier work demonstrating statistically lower ADG and profit (for wild steers as compared to docile steers (Faber 1999).

Toughness and dark cutting characteristics are two critical components behind raising feeder cattle. The negative consumer effects from toughness and dark cutting carcasses cut into producer profits by as much as $5.00 and $2.89 per head, respectively. Surveys conducted among restaurateurs and retailers have shown that these traits rank among the top 10 concerns when it comes to quality beef (Voisinet, 1997b).

Studies show that there is a significant relationship between dark cutting carcasses and animal behavior. Animal behaviors caused by mixing unfamiliar cattle together can result in fighting, mounting and other aversive behavior that can increase an animal's physical stress and increase the chance of producing a dark cutting carcass (Voisinet, 1997b).

Evaluating livestock temperament through the use of chute scores and comparing these results to individual carcass data, Voisinet et al. (1997b) studied the effects of temperament on toughness and dark cutting in B. indicus-cross feedlot cattle.

A four-point temperament score (chute scores) was used to assess each animal's disposition, and after being harvested at a large commercial beef packing plant carcass characteristics were evaluated. USDA graders collected the information regarding dark cutting characteristics, and researchers determined toughness by a cooking strip loin from each animal and testing them on a Warner-Bratzler shear machine.

Results from the experiment showed that more excitable animals had more borderline dark cutters and tougher meat characteristics than animals with calm temperaments. Excitable animals had carcasses that exceeded the food service industry's acceptable threshold for tenderness 40% of the time. Steers with a temperament ranking of 1 to 3 averaged a steak beyond acceptable tenderness levels 13.7%. Dark cutting characteristics followed the same trend. Cattle with calm temperament scores had dark cutting carcasses 6.7% of the time whereas 25% of the carcasses from highly excitable animals were dark cutting (Voisinet, 1997b).

One might assume that breed influenced the presence of dark cutters. However, previous research has not been consistent in determining a breed's relationship to dark cutting. A possible reason might be that animals with more excitable temperaments are more susceptible to stress generated by routine handling practices that occur prior to slaughter. The increased susceptibility to stress could then lead to more borderline dark cutting beef cattle carcasses (Voisinet, 1997b).

Carcasses from more excitable animals have a greater tendency to produce less tender, borderline darker cutting carcasses. With this in mind, producers can make culling decisions within a breeding program and select for temperament as a possible option to decrease the number of carcasses that harvest lower quality meat at slaughter time.

What determines disposition?

Along with differences in calving ease, marbling and average daily gain come differences in temperament and temperament can be largely influenced by the genetics used breeding decisions (Gauly et al., 2001). A variety of factors can contribute to the temperament of the animal, but research shows that temperament is moderately heritable. Producers thus have some control over the temperament of cattle by selecting cattle based on behavior (Voisinet, 1997a).

The North American Limousin Foundation members in the early 1990's identified improving disposition as the number-one breed priority. The developed a temperament scoring system and developed the industry's first temperament or docility EPD. Rapid genetic progress was possible given the strong heritability of .40, estimated for the Limousin breed. In 1993, 73% of the Limousin cattle evaluated were scored as calm. In 2003, the % of the Limousin cattle evaluated as calm increased to 91 % (Hyde 2003).

Studies have been conducted that compare the temperament scores of a variety of breeds. Research conducted in 1997 by Voisinet et al. found B. indicus cattle to be more aggressive than B. taurus breeds. Another study on the influence of breed and rearing conditions conducted by Boivin et al. (1994) found that Salers and Limousin cattle had significant differences in mobility. However, other studies found no difference in temperament between cattle raised in similar environments (Gauly et al, 2001 and Goonewardene et al., 1999). Even observations between B. indicus-cross cattle were inconsistent in establishing a relationship between temperament and the percent of Brahman influence in a steer (Voisinet, 1997a).

There have been a variety of explanations to justify the mixed results. One of the comments made by authors was limited population size and number of breeds evaluated (Gauly et al., 2001). A difference in sire temperaments within a breed was also listed as a possibility. Boivin et al. noticed that among Limousin-sired calves used in the study one sire in particular had eight out of 11 calves receive an aggressive temperament score, while other sires only had a mean of two in 11 calves receive an aggressive score (1994).

The larger, more diverse populations studied in the Iowa Tri-County Steer Carcass Futurity addressed the possible inconsistencies among earlier research.

The effect of sire breed on average disposition score of all calves where sire breed was identified.

Sire Breed	Number of Calves	Average Disposition Score
Hereford Polled Hereford	651	1.297
Simmental	894	1.589
Red Angus	464	1.617
Angus	6,914	1.618
Gelbvieh	579	1.701
Charolais	561	1.834
Limousin	263	1.860
Brangus	479	2.243

11,619 steers were temperament scored with a 6-point system 3 or 4 different times from arrival at the feedlot until being sorted and delivered to the meat processing plant. Of the known purebred cattle evaluated, Charolais were the most aggressive with a mean disposition score of 3.031 and Simmental were the most docile with a score of 1.807. The small score differentiation between breeds could possibly support earlier data that found no significant difference between certain breeds of cattle (Busby 2005).

Possible complications in our evaluation is the cattle were all reared in different environments, which could have an impact on temperament and the ability to understand the full effects of breed on temperament. And producers involved in the Tri-County Steer Carcass Futurity program do not randomly select sires or breeds.

Canadian work compared beef heifers exposed to prerecorded human handling noise, metal clanging and no noise. For 5 consecutive days, the heifer's heart rate and movement were measured while they were constrained in an electronic scale in a chute complex. They concluded by eliminating or reducing the sounds of metal clanging and particularly the sounds of humans shouting should help reduce the level of fear cattle experience during handling (Waynert 1999).

Detecting temperament and selecting for calmness

The moderate heritability of temperament coupled with an increased producer interest on the effects it can have on profitability and animal welfare have made selecting animals based on behavior more popular. Producers have a variety of opportunities to identify the temperament of cattle. One way to evaluate an animal's temperament can be watching how it reacts to various stimuli (Lanier, 2000).

In a study involving six livestock auction markets, Lanier et al. (2000) realized that cattle flinched or immediately motioned to sudden sounds, motions, touches or any combination of stimuli. Observers in the study evaluated studied animals' attentiveness to stimuli and also scored animal temperament. Through the evaluation they found cattle with higher temperaments to be more receptive to the environment around them (Lanier, 2000).

The data collected was quite interesting. They found that cattle with temperament scores of 3 or 4 were less likely to defecate in the auction ring. This could possibly be linked to more excitable animals defecating before reaching the auction ring. Auctioneer's continual sale call did not startle animals as much as sudden intermittent sounds like a ring man yelling out a bid or a child making noise in the stands. Sudden movements like an auctioneer raising an arm or a child running by the front of the sale pen was also noticed by cattle more frequently than slow movements. The reasons for this could lie in the fact that cattle were historically animals of prey. Their senses give them a heightened response to sudden movements like a predator might have (Lanier, 2000).

Producers could possibly evaluate cattle reaction times to stimuli as a method to assess cattle temperament when selecting breeding stock without needing to see actual handling or chute scores. Cow/calf producers do consider temperament as an important selection trait. Surveys have found that disposition ranked second, only to birth weight, as the most important trait in bull selection. If producers desire to have calm cattle that are easy to work with, studying cattle's sensitivity to stimuli could offer an easy method of determining temperament (Lanier, 2000).

Handling facilities

A 1997 study conducted by the Biosystems and Agricultural Engineering Department at Oklahoma State University described conditions associated with 150 cattle handling injury cases on 100 Oklahoma cow-calf operations. The study showed that more than 50% of injuries in these situations were due to human error, while equipment and facilities accounted for about 25% of the perceived causes. In most cases, a better understanding of how an animal may respond to human interaction and to its immediate surroundings will help keep the animal handler from becoming an injury victim (Hubert 1998).

Human error is the primary cause of many types of accidents. These errors in judgment and action are due to a variety of reasons, but occur most often when people are tired, hurried, upset, preoccupied or careless. Remember that human physical, psychological and physiological factors greatly affect the occurrence of life threatening accidents. Using this information in combination with proper cattle handling techniques can reduce you and your cattle's risk to injury.

An animal's senses function like those of a human; however, most animals detect and perceive their environments very differently as compared to the way humans detect and perceive the same surroundings. While cattle have poor color recognition and poor depth perception, their hearing is extremely sensitive relative to humans. Knowing these characteristics, we can better understand why cattle are often skittish or balky in unfamiliar surroundings.

Cattle have panoramic vision, meaning they can see in all directions, except directly behind, without moving their head. Additionally, cattle have poor depth perception, especially when they are moving with their heads up. In order to see depth, they have to stop and put their heads down. For this reason, unfamiliar objects and shadows on the ground are the primary reasons for cattle balking and delaying the animals behind them. This is why it is important for handling and working facilities be constructed to minimize shadows.

Cattle have a tendency to move toward the light. If working cattle at night, use frosted lamps that do not glare in the animal's faces. Position these lights in the area where you are moving cattle, such as a trailer or barn.

Moving a group of cattle takes some knowledge and understanding of the animal's "flight zone." The flight zone is an animal's personal space. When a person penetrates the flight zone, the animal will move. Conversely, when you

retreat from the flight zone, the animal will stop moving. Understanding the flight zone is the key to easy, quiet handling of your cattle.

The size of an animal's flight zone depends on the animal's temperament, the angle of the handler's approach and the animal's state of excitement. Work at the edge of the flight zone at a 45 to 60 degree angle behind the animal's shoulder. Cattle will circle away from you. The flight zone radius can range from 5 to over 25 feet for feedlot cattle and as far as 300 feet for some range cattle. If you are within their flight zone, the animal moves away or retreats.

Cattle follow the leader and are motivated to follow each other. Each animal should be able to see others ahead of it. Make single file chutes at least 20 to 30 feet long. In crowding pens, consider handling cattle in small groups up to 10 head. The cattle need room to turn. Use their instinctive following behavior to fill the chute. Wait until the single file chute is almost empty to fill the chute. Leaving one animal in the single file chute serves as bait for the next group. A crowding gate is used to follow the cattle, not to shove against them.

Pens serve several purposes, including catching, holding cattle being worked and sorting cattle into groups. When designing and constructing pens for working facilities, consider the following:

- Provide at least 20' x 20' per head for mature cattle
- Size pens for a maximum of 50 head of mature cattle.
- Larger, wider pens can make effective sorting difficult for a single worker.
- Pens to small or narrow can result in workers entering the animal's flight zone. The smallest pen dimensions should be no less than 16 feet.
- Too few pens can make separating animals difficult. This can also put handlers at risk, as they must physically enter pens with large numbers of agitated animals.
- Use proper gate placement to facilitate animal movement from pen to pen and to other areas. Poor animal movement puts workers at risk by having to force the movement. If there are too few gates, some animals can become separated. Thus, when animals enter the alley, separated herdmates will follow along the inside of the pen. This often referred to as "backwash". There may be problems guiding these pen-bound animals back to the exit gate as their herdmates move away from them down the alley.
- Placing gates in a herringbone style avoids a 90 degree angle corner in the pen.

Keep the design of sorting facilities and alleyways simple. For most operations, a single alley is used for sorting, as well as moving cattle to and from the working area. Alley width should be 12 to 14 feet with a 10-foot minimum. Wider alleys can make it easier for cattle to escape around you. Pens that are too narrow fail to give the animals room enough to maneuver.

The crowding area should be designed and located so cattle can be easily moved into this area from a common sorting alley that is fed by adjacent holding pens. A circular crowding area with totally enclosed sides and crowding gate is

effective because the only escape route visible to the cattle is through the working or loading chute exits. The crowding gate should also be solid and designed to prevent animals from reversing the gate's direction. Do not overload the crowding area. A catwalk around the outside of the crowding pen allows workers to maneuver animals toward the chute while avoiding direct animal contact. Position the catwalk 36 inches below the top of the fence.

Ideally the single file or working chute should be curved with totally enclosed sides. Cattle move more freely because they cannot view the handlers or the squeeze chute until they approach the rear gate of the squeeze chute. Slopped sides in the working chute restrict the animal's feet and legs to a narrow path, which in turn reduces balking and helps prevent an animal from turning around. Sloping sides work well in most cow-calf operations because different sizes of cattle can be worked efficiently in the same chute. Recommended width for the bottom of the chute is 16 inches, while the top should be about 28 inches. For large-framed cattle, the top dimension for the cattle over the 1200 pounds should be increased 2 inches. To accommodate large-framed bulls, it may be necessary to increase the top width by 4 inches or more. For adjustable straight sided alleyways, the range in width should be from 18 inches to 32 inches. Emergency release panels are highly recommended. With solid-sided chutes, backstops are normally suspended or mounted from above. Backstops should be adjusted to block an animal six to eight inches below the top of the tailhead.

Summary

Disposition or temperament is a moderately heritable trait that impacts feedlot gain, health, quality grade and ultimately profit in the feedlot. How beef cattle handled impacts the amount of stress they feel during routine feedlot processing. An understanding of the beef animal's vision and hearing will help the beef producer reduce handling stress for beef cattle.

Reducing sound, both human voices and clanging metal are positive steps for reducing stress on cattle and ultimately, the people handling them. Properly designed working facilities with solid sides, well positioned gates, proper width for the size cattle being processed will provide a safer work environment for both cattle and people.

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