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Short communication

**Cattle with hair whorl patterns above the eyes are
more behaviorally agitated during restraint**

T. Grandin*, M.J. Deesing, J.J. Struthers, A.M. Swinker

Department of Animal Sciences, Colorado State University, Fort Collins, CO 80523, USA

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An International Scientific Journal reporting on the Application of Ethology to Animals used by Man

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Cattle with hair whorl patterns above the eyes are more behaviorally agitated during restraint

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Abstract

Hair whorl position on the forehead may be of value in selecting breeding cattle for a calm temperament. A total of 1500 cattle weighing 180-360 kg were temperament rated on a four-point scale. Seventy-two percent of the cattle were European × British breed crosses and 28% were Zebu × dairy breed crosses from Mexico. Cattle with a round hair whorl located above the eyes became significantly more agitated while they were restrained in a squeeze chute (crush) compared to cattle with a hair whorl located either between the eyes or below the eyes. For both the *Bos taurus* and *Bos indicus* crossbreeds, animals with hair whorls located below the eyes were rated calmer. There is a positive linear relationship ($P < 0.001$) between cattle temperament while restrained in a squeeze chute and the location of facial hair whorls. The cattle observed in this study were extensively raised and had a large flight zone when approached by people. Casual observations indicate that the relationship between hair whorl position and temperament is most easily observed in cattle that do not have daily close contact with people.

Keywords: Hair whorls; Temperament; Restraint; Handling

1. Introduction

There is a need to develop easy ways to select cattle with a calm temperament. Cattle with an excitable temperament are more difficult and dangerous to handle. Temperament rating methods used by Grandin (1993) and Fordyce et al. (1988) are useful for temperament assessment of older animals, but they are less valuable for assessment of temperament in very young calves. There is an increasing need to develop methods for measuring temperament as observations by the authors indicate that indiscriminant selection for lean

*Corresponding author.

cattle with rapid growth is producing more excitable, difficult-to-handle cattle (Grandin, 1994).

Horse trainers have casually observed that the position of round hair whorls (trichoglyphs) on a horse's forehead is related to temperament (Tellington-Jones and Bruns, 1985; Barker, 1990; Friedly, 1990). The second author has observed during his work as a horse trainer that hair whorl position has been useful in predicting the behavior of a horse during training. The objective of this study is to determine if there is a relationship between hair whorl position and temperament in cattle. Hair whorl position could then possibly be used for predicting future temperament traits in very young calves.

2. Animals, materials and methods

Heifers and steers ($n=1500$) weighing 180-360 kg were temperament rated while restrained in a squeeze chute (crush) for vaccination, ear tagging and other routine husbandry procedures. Fourteen different groups of cattle from different origins were observed during routine handling at a large commercial feedyard in Colorado. The size of the groups ranged from 90 to 300 cattle and the animals had been purchased from different ranchers and auctions. Seventy-two percent of the cattle were European Continental \times British breed crosses and 28% were Zebu \times dairy breed crosses from Mexico. The *Bos taurus* European Continental \times British breed crosses consisted of a mixture of crosses which varied from group to group of Hereford, Angus, Gelbvieh, Salers, Charolais, Simmental and Limousin. The Zebu \times dairy breed crosses consisted mainly of one-half to one-quarter Zebu crossed with either Holstein, Brown Swiss or Jersey.

Each animal was individually restrained in a hydraulic squeeze chute (C&S Equipment Company, Garden City, Kansas, USA). The head of each animal was restrained in a stanchion (head bail; C&S Equipment Company) clamped around its neck and the body was held between two squeeze panels.

Data were also analyzed using the General Linear Models procedure regression (Statistical Analysis Systems Institute Inc., 1985). Means of among group comparisons were made on temperament and hair whorl variables using analysis of variance. Chi-square analysis was conducted on cattle that received the highest temperament rating of 4 and the lowest rating of 1.

2.1. Temperament ratings

One observer stood by the squeeze chute and scored each animal on a four-point scale. The rating was made after the head was clamped in the stanchion. The ratings were: 1, calm, no movement; 2, restless, shifting weight; 3, head throwing, squirming and occasionally shaking the squeeze chute; 4, violently and continually shaking the squeeze chute. Animals that reared in the squeeze chute were also given a 4 rating. A four-point rating scale was used instead of the five-point rating scale used by Grandin (1993) because the cattle were restrained in a hydraulic squeeze chute. A hydraulic squeeze chute grips the animal more tightly and makes it more difficult to differentiate between different ratings compared to the manually operated squeeze chute used by Grandin (1993).

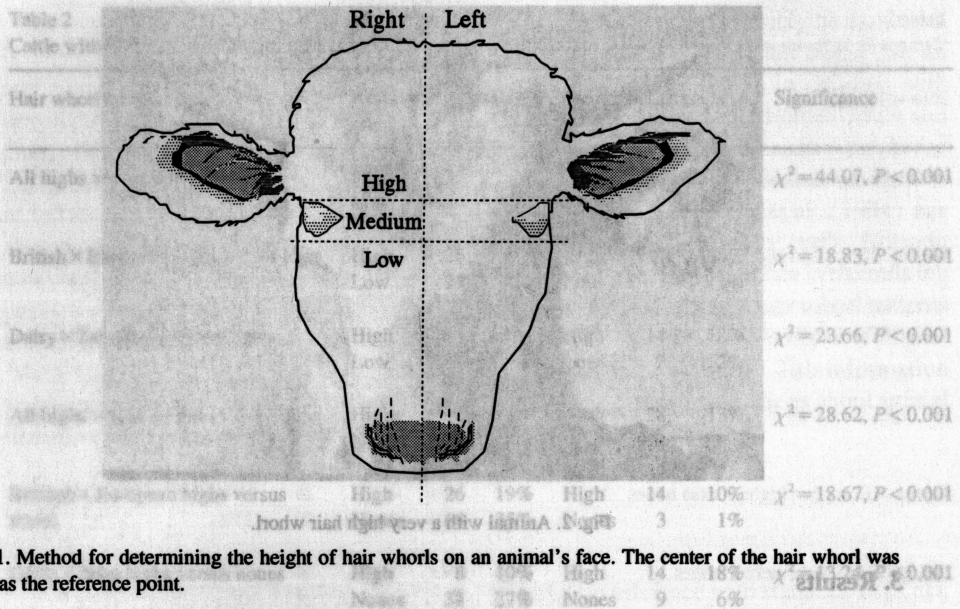


Fig. 1. Method for determining the height of hair whorls on an animal's face. The center of the hair whorl was used as the reference point.

A second rating of behavior while exiting from the squeeze chute was also recorded. The ratings were: 1, calm, exiting at a walk; 2, exited at a trot or backed up briefly into the rear tailgate before exiting at a trot; 3, the animal immediately jumped out of the squeeze chute and ran, or it backed up against the rear tailgate and refused to exit until it was tapped on the hindquarters. All animals with a rating of 3 ran rapidly out of the squeeze chute. The person doing the temperament ratings stood on the ground about 3 m away from the squeeze chute near the rear tailgate. From this position, the hair whorls on the animal's forehead could not be seen. Solid sides on the lead-up race prevented observation of the foreheads of cattle waiting to enter the squeeze chute. Therefore, the person doing the temperament rating was blind to the hair whorl position.

2.2. Hair whorl measurements

Hair whorl position was recorded by another person as each animal entered the squeeze chute. This person was positioned on a catwalk immediately behind the rear tailgate of the squeeze chute. Standing on the catwalk enabled the observer to have a clear view of hair whorl position by looking over the top of the solid sides on the leadup race. The center of the hair whorl was used as the reference point to determine its position. The hair whorl position was categorized as: 'high' if the center was above the top of the eyes; 'middle' if the center was located between the top of the eyes and the bottom of the eyes; 'low' if the center was located below the bottom of the eyes (Figs. 1 and 2). Animals with two spiral hair whorls side by side (doubles) and no hair whorls on the forehead (none) were also recorded.

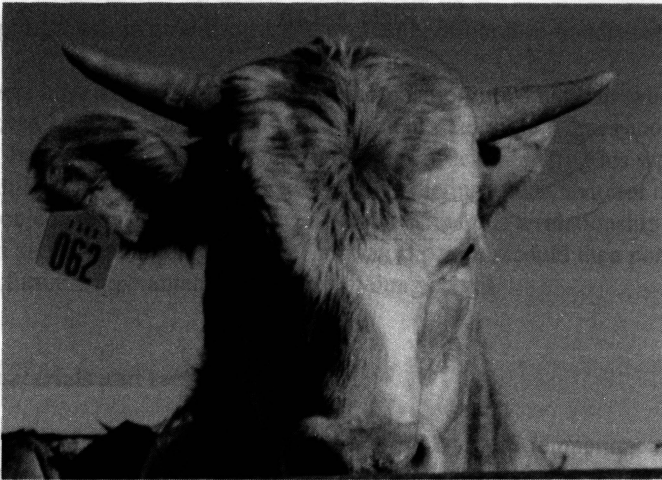


Fig. 2. Animal with a very high hair whorl.

3. Results

Cattle with a hair whorl above the eyes were more agitated both in the squeeze chute and while exiting from the squeeze chute (Table 1). There is a positive linear relationship ($P < 0.001$) between cattle temperament while restrained in the squeeze chute and the location of the facial hair whorl. The results suggest the higher the facial hair whorl on the

Table 1

Mean temperature rating both in and exiting a squeeze chute and standard errors by facial hair whorl pattern, type and height

Hair whorl type ^a	High		Middle		Low		None		Abnormal	
	No. animals	Rating	No. animals	Rating	No. animals	Rating	No. animals	Rating	No. animals	Rating
Temperament in										
Single	183	2.39 ± 0.06 ^a	338	2.15 ± 0.04	203	1.98 ± 0.05	336	1.94 ± 0.04	38	2.03 ± 0.13
Spiral	19	2.21 ± 0.18	24	1.75 ± 0.16	45	1.91 ± 0.11				
Flare	17	2.41 ± 0.19 ^a	68	2.23 ± 0.09 ^a	195	1.89 ± 0.06				
Double	12	2.33 ± 0.22 ^c	9	1.88 ± 0.26	13	2.23 ± 0.22 ^c				
Temperament exiting										
Single	183	1.93 ± 0.05 ^a	338	1.76 ± 0.04	203	1.66 ± 0.05	336	1.76 ± 0.04	38	1.64 ± 0.12
Spiral	19	1.79 ± 0.17	24	1.58 ± 0.15	45	1.60 ± 0.11				
Flare	17	2.06 ± 0.18 ^b	68	1.95 ± 0.09 ^b	195	1.70 ± 0.05				
Double	12	2.08 ± 0.22 ^c	9	1.66 ± 0.26	13	1.53 ± 0.22				

^aMeans differ ($P < 0.01$).

^bMeans differ ($P < 0.05$).

^cMeans differ ($P < 0.10$).

^aDefinitions of hair whorl type: single, tight, round, symmetrical hair whorl located along the vertical midline of the face; spiral, tight, round, symmetrical hair whorl located off center either over or under the eyes; flare, spiral pattern that is no longer symmetrical, but still has a definite center; double, two tight, round, symmetrical hair whorls; none, no hair whorl pattern; abnormal, hair patterns without an easily distinguished center.

Table 2
Cattle with high hair whorls had greater agitation in the squeeze chute

Hair whorl type	Number of animals rated 1		Number of animals rated 4		Significance
All highs versus all lows	High	34 16%	High	28 13%	$\chi^2 = 44.07, P < 0.001$
	Low	134 30%	Low	9 2%	
British \times European highs versus lows	High	26 19%	High	14 10%	$\chi^2 = 18.83, P < 0.001$
	Low	99 27%	Low	7 1%	
Dairy \times Zebu highs versus lows	High	8 10%	High	14 18%	$\chi^2 = 23.66, P < 0.001$
	Low	35 40%	Low	2 2%	
All highs versus all nones	High	34 16%	High	28 13%	$\chi^2 = 28.62, P < 0.001$
	Nones	106 31%	Nones	12 3%	
British \times European highs versus nones	High	26 19%	High	14 10%	$\chi^2 = 18.67, P < 0.001$
	Nones	68 35%	Nones	3 1%	
Dairy \times Zebu highs versus nones	High	8 10%	High	14 18%	$\chi^2 = 13.24, P < 0.001$
	Nones	38 27%	Nones	9 6%	

forehead, the more reactive the animal is to being restrained in a squeeze chute. Also, while exiting the squeeze chute, the cattle with higher hair whorls had a higher temperament rating ($P < 0.01$). When all the cattle were sorted into two categories of 1's (very calm) and 4's (very agitated), chi-square analysis indicated that hair whorl height had a significant ($P < 0.001$) effect on the percentage of animals that were rated either 1 or 4 (Table 2). The effect of hair whorl height on temperament ratings in the squeeze chute was similar for both the *Bos taurus* and *Bos indicus* cattle ($P < 0.001$; Table 2). Hair whorl height on temperament during exiting of the squeeze chute was also similar for both *Bos taurus* and *Bos indicus* \times *Bos taurus* crosses ($P < 0.04$; Table 3). Regardless of cattle type, groups of animals with high hair whorls had a higher percentage of agitated animals as compared to groups of animals with low hair whorls. Tables 2 and 3 also show that cattle with a high hair whorl were more agitated than cattle without a hair whorl (nones) ($P < 0.01$). The distribution of hair whorl heights of the cattle observed was 14% high hair whorls, 30% middle hair whorls, 29% low hair whorls and 22% nones (Fig. 3).

4. Discussion

Hair whorl height is a useful indicator of excitability levels that is clearly measurable on cattle from many different origins. The European Continental \times British crosses came from over 35 different ranches and the Zebu \times dairy breed crosses came from over 90 different ranches. Therefore, it is unlikely that our findings are due to previous handling experiences. Temperament ratings are definitely affected by hair whorl height.

It may be useful in predicting the temperament of calves, but further research is needed. Some of the animals observed had abnormal hair whorl patterns on the forehead and face

Table 3
Cattle with high whorls had greater agitation while exiting from squeeze chute

Hair whorl type	Number of animals rated 1		Number of animals rated 4		Significance
All highs versus all lows	High	68 32%	High	53 25%	$\chi^2 = 15.68, P < 0.001$
	Low	212 47%	Low	67 14%	
British × European highs versus lows	High	45 33%	High	29 21%	$\chi^2 = 7.69, P < 0.01$
	Low	29 8%	Low	50 13%	
Dairy × Zebu highs versus lows	High	23 29%	High	24 31%	$\chi^2 = 4.78, P < 0.04$
	Low	40 45%	Low	17 19%	
All highs versus all nones	High	68 32%	High	53 25%	$\chi^2 = 7.59, P < 0.01$
	Nones	149 44%	Nones	60 18%	
British × European highs versus nones	High	45 33%	High	29 21%	$\chi^2 = 14.54, P < 0.001$
	Nones	8 4%	Nones	29 15%	
Dairy × Zebu highs versus nones	High	23 30%	High	24 31%	$\chi^2 = 3.10, P < 0.06$
	Nones	57 40%	Nones	31 22%	

that did not form tight, round spirals. Animals with hair whorls (located below the eye) that flaired instead of forming a tight, round spiral appeared to be more unpredictable in behavior. These animals seemed to be more erratic and likely to run into other cattle or fences. Casual observations indicate that the relationship between hair whorl position and temperament is most easily observed in cattle that are not accustomed to daily close contact with people. The cattle observed in this study had been raised under extensive range conditions prior to arrival at the feedlot. Possibly taming and daily association with people may partially mask underlying temperament traits because taming reduces or eliminates the animal's flight zone.

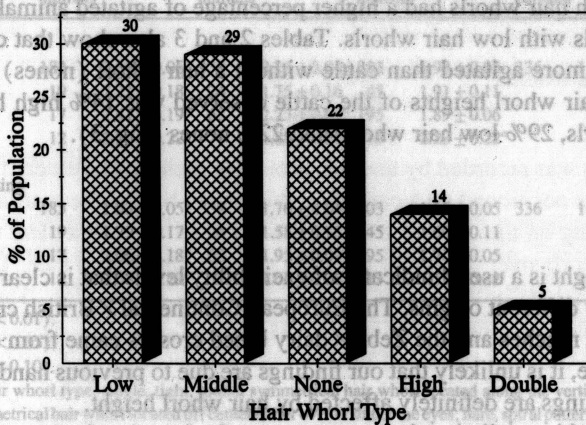


Fig. 3. Distribution of hair whorls in the surveyed cattle.

The relationship between hair whorl height and temperament may possibly be explained by the fact that hair patterns in the fetus form at the same time as the brain forms (Smith and Gong, 1974). In humans, abnormal hair whorl patterns are found in children with developmental disorders such as Down's syndrome and Prader-Willi syndrome (Smith and Gong, 1973, 1974). Alexander et al. (1992) found a higher prevalence of counter-clockwise hair whorls in schizophrenics. Ortiz de Zarate and Ortiz de Zarate (1991) found that 78.49% of left-handed people had a right-sided hair whorl. Research by Tanner et al. (1994) has also shown that hair whorl patterns are correlated with behavior in dairy cattle. Holstein cows with two round spiral whorls on their foreheads had less side preference in the milking parlor compared to other cows. These two studies show very clearly that hair whorl patterns are associated with behavioral traits. Further study of hair whorl patterns may find further relationships between hair whorl patterns and behavior in cattle and horses. This information would be useful to both cattle producers and horse trainers to make predictions about animal temperament and thereby alter their handling techniques.

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We wish to thank Dan Kniffen and Donna Murphy for assistance with statistics and Dick Farr of Farr Feeders in Greeley, Colorado, for providing facilities and cattle for this study.

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The relationship between hair whorl type and temperament may possibly be explained by the fact that hair whorl type is the same in the same family (Smith and Gong, 1974). In humans, abnormal hair whorl patterns are found in children with developmental disorders such as Down's syndrome and Kluver-Bucay syndrome (Smith and Gong, 1974). Alexander et al. (1992) found a higher prevalence of counter-clockwise hair whorls in schizophrenics. Ortiz de Zarate and Ortiz de Zarate (1991) found that 78% of left-handed people had a right-sided hair whorl. Research by Tanner et al. (1994) has also shown that hair whorl patterns are correlated with behavior in dairy cattle. Holstein cows with two round spiral whorls on their foreheads had less side preference in the milking parlour compared to other cows. These two studies show very clearly that hair whorl patterns are associated with behavioral traits. Further study of hair whorl patterns may further the relationship between hair whorl patterns and behavior in cattle and horses. This information would be useful to both cattle producers and horse trainers to make predictions about animal temperament and thereby alter their handling techniques.

Acknowledgements

1000.0 $P < 0.0001$ $\chi^2 = 14.54$ High 29 41% Nones 29 15%
 96.0 $P < 0.0001$ $\chi^2 = 31.2$ High 24 41% Nones 28 47%

We wish to thank Dan Kiffin and Donna Murphy for assistance with statistics and Dick Part of Pat Feders in Greeley, Colorado, for providing facilities and cattle for this study.

that did not form tight round spirals. An axial spiral is a hair whorl that is formed in a flat or shallow depression on the head or neck instead of forming a tight, rounded spiral. These animals seemed to be more easily handled than those with round spirals. The relationship between hair whorl type and temperament is most easily observed in calves. In a study by Grandin, T. (1994) solving livestock handling problems, it was found that hair whorl type is a good indicator of temperament. In a study by Grandin, T. (1994) solving livestock handling problems, it was found that hair whorl type is a good indicator of temperament. In a study by Grandin, T. (1994) solving livestock handling problems, it was found that hair whorl type is a good indicator of temperament.

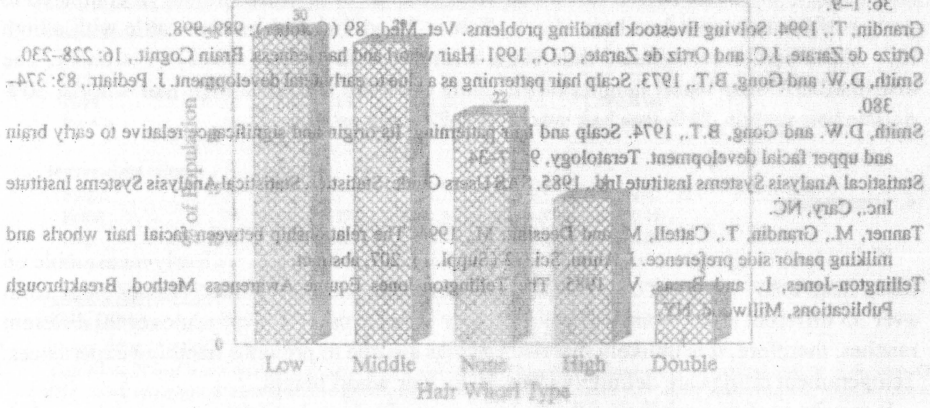


Fig. 3. Distribution of hair whorl type in the surveyed cattle.