GENETIC FACTORS AFFECTING CATTLE TEMPERAMENT IN FOUR BEEF BREEDS

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INTRODUCTION

The reactions of animals to human beings probably were important to define which of those was going to be domesticated. Recently, researchers and farmers have given their attention to cattle reactions during handling and they are using these to describe its temperament.

Cattle have been classified according to some aspects of their temperament, even during data collection, for example: "… an electric proud was used on only one stubborn animal…" (Grandin, 1993). This type of characterisation is quite common among people who are engaged in cattle management. They know, intuitively, that the level of cattle reactivity is related to human and cattle safety and welfare, herd productivity and meat quality, as confirmed by Fordyce *et al.* (1988) and Grandin (1993). However, there still is some confusion over the meaning of the term temperament. In a wide sense it represents the pool of individual's psychophysiological traits that determine emotional reactions. In this study we assumed that temperament could be assessed in a restrict sense; it is represented here by the reactions of animals in relation to human beings, generally attributed to fear (Fordyce *et al*., 1982).

To characterise and quantify cattle temperament in the farming context is the current challenge, it is necessary to develop a valid and simple methodology to make possible its utilisation by the farmers. The aim of this study was to evaluate genetic factors affecting cattle temperament in a Brazilian herd, using two measurement methods.

MATERIAL AND METHODS

This research was carried out in an experimental research farm (Estação Experimental de Zootecnia de Sertãozinho, at São Paulo State, Brazil), where the temperament of four beef cattle breeds, Nelore, Gir, Guzerá (*Bos taurus indicus*) and Caracu (*Bos taurus taurus,* a Brazilian native breed which is descendent of Portuguese cattle introduced into Brazil in the XVI century) was evaluated.

The measurements flight speed (FS) and agitation score (AS) were taken from Nelore (N_{FS}=364 and N_{AS} = 88), Gir (N_{FS}=257 and N_{AS} = 50), Guzerá (N_{FS}=536 and N_{AS} = 113) and Caracu (N_{FS}=393 and N_{AS} = 94) cows. The flight speed was evaluated using the equipment described by Burrow *et al*. (1988). It has two photoelectric cells placed in line (2 meters apart) at the exit of the scale. The animals' speed was measured when they were escaping from the scale. When an animal crossed the first photocell an electronic stopwatch was switched on and it was switched off when the animal crossed the second one. Agitation score was based on

animal's activities, combining scores of movements, vocalisation, breathing and kicking during weighing; a five-point scale was applied, adapted from Fordyce *et al*. (1982), where the largest score represented the highest level of agitation.

The data analyses were done by restrict maximum likelihood applying a sire model, using the Mixed Procedure from the software SAS. For FS the model included: sire within breed, as random effect; breed and body condition, as fixed effects; and age, time waiting in the corral before weighing and entrance order in the scale, as covariables. For AS we also included in the model the effect of animal within sire and breed (repeated measurements). The heritability of FS and AS were estimated using paternal half-sibling correlation.

The predicted breeding values (p) of bulls for FS and AS were calculated by:
$p= Pc +Rh^2 [n/ 1+(n-1)t] (Ps –Pc)$,
where n= number of offspring, R=0.25 (half sibs relationships), h^2 = heritability, $t = 0.25h^2$ (for paternal half sibling), Ps = average of sibling, Pc = average of the contemporary group.

The bulls were ranked according to their p value, and Spearman Rank Coefficients of Correlation (r_s) were estimated. The FS and AS means were compared among breeds by the Tukey test.

RESULTS AND DISCUSSION

There were expressive variation on FS and AS measurements, with significant effects of breed for both variables and effects of sire within breed, and animal within breed and sire for AS. Body condition, age, time waiting in the corral before weighing and entrance order in the scale did not affect ($P>0.05$) FS and AS.

Caracu breed (*Bos taurus taurus*) was less reactive, combining higher FS and lower AS than Nelore, Gir and Guzerá (*Bos taurus indicus*). Among the Zebu breeds, Nelore presented lower reactivity than Gir and Guzerá (Figure 1). These results are in agreement with others comparing *Bos taurus taurus* and *Bos taurus indicus*, being the former one less reactive than the later (Hernschaw and Morris, 1984; Burrow, 1991).

The heritability estimates were 0.35 for FS and 0.34 for AS. Many authors have found higher values than us. For AS the values of heritability have been reported ranging from 0.46 (Hearnshaw and Morris, 1984: for crossed calves, Hereford dams and Brahman, Braford and Africander sires) to 0.67 (Fordyce *et al*., 1982: for Zebu and European breeds). Burrow *et al.* (1988), working with crossed cattle (Zebu x European), have estimated 0.54 as the value of FS heritability.

As expected the association between FS and AS was negative ($r_s = –0.628$, $P<0.001$). However, this value indicated that FS and AS are not the same trait, although they could be partially controlled by the same mechanisms. The distribution of the bulls' predicted breeding values (p) of flight speed (FS) and agitation score (AS) are presented in Figure 2.

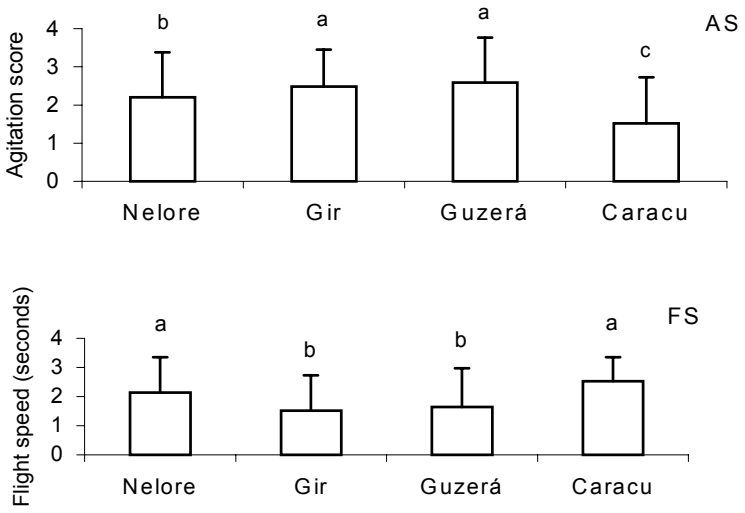

Figure 1. Flight speed (FS) and agitation score (AS) means and respective standard deviations, of four beef cattle breeds. Means differed significantly by Tukey test when followed by different letters (a>b>c)

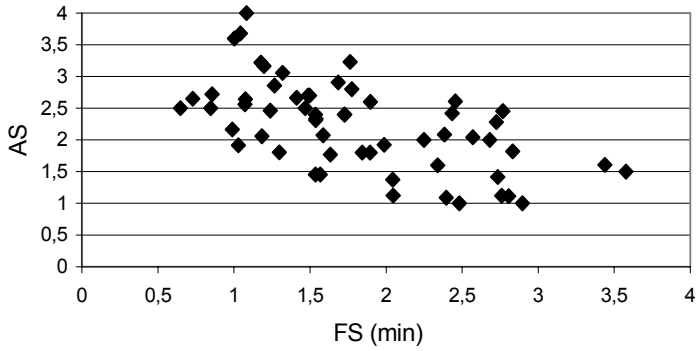

Figure 2. Distribution of the sires' predicted breeding values (◆) for flight speed (FS) and agitation score (AS)

CONCLUSION

These results suggest that cattle temperament is influenced by genetic factors and may be manipulated through selection. The association between flight speed and agitation score measurements does not allowed us to consider them as just one trait, probably they represent specific (and different) aspects of the cattle temperament, such as docility and fearfulness, respectively.

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