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Impact of the temperament of Nellore cows on the quality of handling and pregnancy rates in fixed-time artificial insemination

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ABSTRACT

The aim of this study was to evaluate the effects of temperament on the quality and efficiency of handling and on the pregnancy rate of Nellore cows submitted to a fixed time artificial insemination (FTAI) protocol. Temperament and handling procedures were simultaneously assessed in 798 Nellore cows on the first (d0), ninth (d9) and 11th days (d11) of the FTAI protocol, using the flight speed (FS) and crush score (CS) tests. During the insemination process performed on d11 of the FTAI protocol, the following handling indicators were recorded: rough or overly aggressive handling of the cows by stockpersons (*AGGRESSION*), accidents (*ACCIDENT*), time to inseminate (*TIME*), and the degree of dirtiness on cows' perineal region (*DIRTINESS*). There was a significant effect of CS on *TIME* ($P=0.013$) and *DIRTINESS* ($P=0.004$), while FS tended to affect *TIME* ($P=0.06$) and the likelihood of AGGRESSION ($P=0.07$). Cows subjected to aggressive handling and/or accidents had a greater FS mean than cows that did not face such aversive situations (2.07 ± 1.18 *vs.* 1.74 ± 0.75 m/s, $P=0.0003$). The chance of pregnancy (expressed in odds ratio) was greater in cows with low FS (OR=1.48) than in cows with high FS (defined as the reference class, with OR=1) ($\chi^2=3.73$, $P=0.05$), and the low FS group had 10% more pregnant cows than the high FS group (with 52.59% *vs.* 42.62% pregnant cows, respectively). Pregnant cows had significantly lower FS means relative to non-pregnant cows on d0 (1.79 *vs.* 2.10 m/s, $P<0.001$), d9 (1.67 m/s *vs.* 1.79 m/s, $P=0.038$) and d11 (1.70 m/s *vs.* 1.90 m/s, $P=0.004$). We conclude that excitable temperament has an effect on the quality and efficiency of handling during FTAI, by increasing the time required for insemination, the dirtiness on cows' perineal region and the likelihood of aggressive actions by stockpersons. Also, cattle temperament measured by FS reduces the chance of pregnancy in Nellore beef cows.

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1. Introduction

There is empirical evidence that cattle temperament, defined as individual differences in behavioral responses which are persistent over time and across situations (Bates, 1989), is closely associated with animals' susceptibility to stress (Cafe et al., 2011). Therefore, different temperaments may also determine how much stressful situations affect cattle reproductive efficiency. In fact, some studies have shown that female heifers (Kasimanickam et al., 2014) and multiparous cows (Cooke et al., 2011, 2012) with excitable temperaments had reduced pregnancy rates when compared to calmer ones. There is evidence that this stress-mediated response in more excitable female cattle reflects a more intense and prolonged activation of the HPA axis (Cooke et al., 2012; Kasimanickam et al., 2014).

Besides cows' physiological state, other factors have also been implicated in the relationship between beef cattle temperament and reproductive performance, such as genetic factors (Phocas et al., 2006; Valente et al., 2014) and the quality of human–animal interactions (Dobson et al., 2001). For instance, in a study conducted with dairy cattle, the use of negative actions by stockpersons (*e.g.*, slaps, pushes, hits, and tail twists) was negatively correlated with cows' conception rate (Hemsworth et al., 2000). Moreover, the authors reported that cows that were more fearful of humans conceived at a lower rate at the first insemination. Similar results were found for beef cattle, where *Bos indicus* cows that were handled more poorly (*i.e.*, were exposed to more frequent voice emissions and had accidents) required more handling time in the corral and had lower rates of viable embryos (Macedo et al., 2011). Similarly, two studies carried out by Cooke et al. (2009a,b) showed that heifers and cows acclimated to handling in the corral displayed higher pregnancy rates than those that remained undisturbed, on pasture.

Despite previous studies exploring such variables, we did not find any investigations evaluating the effect of cow temperament on variables of overall handling (*i.e.*, human–animal interactions and insemination time) and body hygiene during artificial insemination (AI). The degree of dirtiness on cows' perineal region may have a practical implication during the AI procedure that is mainly related to the risk of contamination. Here we tested two hypotheses: relative to calmer cows, excitable cows would (i) face more handling problems during AI procedures, be dirtier and require more time to inseminate, and (ii) have lower reproductive performance. Thus, the aim of this study was to evaluate the effects of temperament on the quality and efficiency of handling and on the pregnancy rate of Nellore cows submitted to a fixed-time AI (FTAI) protocol.

2. Materials and methods

The procedures used in this study were approved by the Committee for the Ethical Use of Animals from the Faculty of Agricultural and Veterinary Sciences of Sao Paulo State University (Protocol n. 011784/11), Jaboticabal, Sao Paulo, Brazil.

2.1. Animals and FTAI protocol

The study was conducted at a commercial Nellore breeding farm located in Mato Grosso state, Brazil (14°6′S and 51°5′W). We assessed a total of 798 Nellore cows, all pluriparous, with suckling calves at foot averaging from 3 to 4 mo old. Cows were divided into five lots, and each lot was kept in a specific farm unit, here identified by the letters A through E. The numbers of cows assessed per farm unit were 77, 147, 58, 246 and 270 for units A through E, respectively. In all farm units, cow–calf pairs were grass-fed, kept on pasture with free access to water and mineral supplementation, and handled only occasionally for veterinary or reproductive procedures. For reproductive management, each lot of cows was driven to a corral in its own unit. All corrals consisted of 4 to 5 holding yards, each linked to a forcing yard that led-up to a single-file race, which in turn led to a squeeze chute head restraint.

All cows were subjected to the same FTAI protocol, which was applied at the corral over a period of 11 days using three handling procedures. Cows in each of the five units were handled on different days, but all cows from a specific farm unit faced the same conditions (they were all handled on the same day and by the same stockpersons). The handling routine consisted of driving the cows from the pasture to the corral, where they were held in the holding yards for approximately half an hour. Then, they were driven to the forcing yard in small groups of around 10 cows, and from there, into the single-file race. Finally, one stockperson stimulated each cow individually to walk along the single-file race and enter the squeeze chute. Cows were kept in the squeeze chute for approximately 1 min while the FTAI procedures were carried out. On the first day of handling (d0), the cows received an estradiol benzoate injection (2.0 mg Estrogin, Biofarm, Sao Paulo, Brazil) and an intravaginal progesterone device (1.9 g progesterone, CIDR, Pfizer Saúde Animal, Sao Paulo, Brazil). On the ninth day (d9), estradiol cypionate (0.5 mg ECP, Pfizer Saúde Animal) and dinoprost tromethamine—PGF2α (12.5 mg Lutalyse, Pfizer Saúde Animal) were administered and the progesterone device was removed. AI was performed on the 11th day (d11). Semen from only four purebred Nellore bulls was used and the proportions of semen straws from each bull were evenly distributed among the five farm units ($\chi^2 = 18.67$, $P = 0.10$). Following the procedures, cows (and their calves) returned to the pastures. No additional handling was conducted after finishing the FTAI protocol until 60 days after AI, when pregnancy was determined via transrectal palpation.

At the time of insemination, all cows were evaluated for body condition score (BCS), which is measured on a scale from 1 (thin) to 5 (fat) (variation of 0.25 and 17 grades total), as was routinely done on the farm.

2.2. Temperament assessment

The temperament assessment was conducted by only one trained observer at all three time points of the FTAI protocol (d0, d9 and d11) without changing the handling routine. Two temperament traits were assessed: crush score (CS; described by Sant'Anna et al., 2013 and adapted