Profile plasmatic progesterone and cortisol at the end of gestation and beginning of post-partum period in Nelore cows and heifers

Perfil plasmático de progesterona e de cortisol durante o final da gestação e início do pós-parto de vacas e novilhas Nelore

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Summary: The aim of the present study was to quantify the plasmatic concentration of progesterone (P4) and cortisol in Nelore cows and heifers at the final period of the gestation, and at days 10 and 20 post-partum. Used 15 heifers and 16 cows. Blood samples were collected by caudal venous puncture. The statistical analysis used was the T-test. The plasmatic concentration of P4 was higher in the M1 than in the other moments (for the cows and the heifers), and the concentration of P4 in the M1 in the cows was higher than the concentration in the heifers (p<0.05). Also was observed a tendency (0.05<p<0.10) of a lower cortisol concentration in heifers at the M1 than in cows at the same moment. Within the heifers group there was a tendency of cortisol values are lower in the M1 and M3 (p = 0.051 and p = 0.065 respectively) compared to M2. The decrease on the P4 concentrations in the M2 and M3 was due to the luteolysis of the CL and loss of the fetal membranes. However, the difference observed in the M1 between cows and heifers possibly can be explained due to the smaller CL formed by the ovulation of smaller follicles in this class of animals. There was no difference in plasma levels of cortisol in the three times.

Keywords: Nelore, pluriparous, multiparous, progesterone, cortisol.

Resumo: O objetivo do presente trabalho foi quantificar as concentrações plasmáticas de P4 e cortisol de vacas multiparas e novilhas primiparas Nelore no final da gestação, dez e vinte dias pós-parto. Utilizaram-se 15 novilhas e 16 vacas. Colheram-se amostras de sangue por venopunção caudal, em 3 momentos: M1 dez dias antes do parto previsto, M2 e M3, dez e vinte dias após o parto. Para a dosagem de P4 e de cortisol foi empregado kit comercial de RIA. A análise estatística utilizada foi teste T com p<0.05. Quanto aos níveis plasmáticos de P4, o grupo das vacas pluríparas no M1 apresentou maior concentração em relação ao M2 e M3 (p<0.05). O mesmo sendo observado para o grupo de novilhas. Na comparação entre grupos, as vacas apresentaram maior concentração de P4 em relação às novilhas no M1 (p<0.05), não havendo diferença estatística nos demais momentos. Houve uma tendência (0.05<p<0.10) do grupo de novilhas apresentar uma menor concentração plasmática de cortisol no M1 do que as vacas. Dentro do grupo de novilhas houve uma tendência dos valores de cortisol serem menores no M1 e no M3 (p<0.051 e p<0.065, respectivamente) em relação ao M2. As quedas nos níveis plasmáticos de P4 no M2 e M3 estão relacionadas à lise do CL e perda das membranas fetais. Contudo, a diferença observada no M1 entre vacas e novilhas, possivelmente possa ser explicada em função do menor tamanho do fóliculo e, consequentemente do CL. Não houve diferença nos níveis plasmáticos de cortisol nos três momentos.

Palavras-chave: Nelore, primíparas, multiparas, progesterona, cortisol.

Introduction

During late pregnancy and parturition in cows, immense changes of endocrine parameters occur and exhibit tremendous influence on reproductive organs, involved in the normal process of giving birth. For the normal parturition process to occur, a change from progesterone to estrogen synthesis is crucial and just prior to parturition a pre-partum luteolysis must occur. The cause of this drop in progesterone is due to increasing output of prostaglandins and nature of this output is continuous and not pulsatile as during the luteolysis of the estrus cycle. Therefore, failures of fetal adaptation and improper synthesis and release of hormones at the end of pregnancy can possibly lead to calving difficulty, weak calves and stillbirth, which contribute to the major losses of the calf at term (Konigsson et al., 2001; Kornmatsusuk et al., 2003).

A number of physiological variables, including levels of various hormones, have been analyzed in order to objectively evaluate the effects of a stressful situation. The parturition-induced changes in plasma concentrations of stress hormones, e.g. cortisol, have aroused considerable interest. The elevation of cortisol levels around parturition may be due to the increased need for glucocorticoids, to accelerate mammary growth and initiate lactation, and the fact that estrogens reduce the metabolic clearance rate of cortisol (Kitts, 1985). Twin-bearing cows have higher mean plasma cortisol levels on the day of parturition than in the singleton cows (Kindahl et al., 2002). The function of cortisol during parturition might exert a negative feedback
on prostaglandin production through induction of the phospholipase inhibitor, lipocortin-1 or might be part of a stress influenced labor process (Smith et al., 1973; Hydbring et al., 1999; Kindahl et al., 2002).

The objective of the present study was to quantify the plasmatic concentrations of P4 and cortisol of Nelore breed cows and heifers at 280 days of gestation (ten days before the expected parturition), 10 and 20 days post-partum, aiming to investigate differences among class of animals and moments.

Material and Methods

Thirty one females were used, being fifteen primiparous heifers and sixteen multiparous cows from Nelore breed aging 30 and 60 months, respectively, presenting a good health condition and normal sanitary control.

Blood samples were collected via caudal venous-puncture into blood tubes containing approximately 15 mL of sodium heparin at three moments: M1 (10 days before expected parturition), M2 (10 days post-partum) and M3 (20 days post-partum). Blood was centrifuged with plasma being stored into 1.5 mL tubes and frozen at -20°C. Progesterone and cortisol assays were performed using RIA (Coat-A-Count, Diagnostic Products Corporation, Los Angeles, USA).

Data was submitted to analysis of variance to verify differences among means, and paired and non-paired Student T-tests were used to compare moments within groups, and groups within moments, respectively, establishing as significant a p < 0.05.

Results

In the present study 100% of births were characterized by singleton and they did not require assistance or c-section, with absence of stillbirth and neonatal death.

Higher plasma progesterone concentrations were determined in cows and heifers at M1 when compared to M2 and M3 (p<0.05). Those cows presented higher P4 concentrations than heifers at M1 (p<0.05), with no difference at other moments, as shown at table 01.

A tendency (0.05<p<0.10) to lower plasma cortisol concentrations was observed in heifers (1.00 ± 0.10 µg/mL) than in cows (1.23 ± 0.12 µg/mL). Those heifers presented a tendency to lower cortisol concentrations at M1 and M3 when compared to M2, p=0.051 and p=0.065, respectively.

Table 01 - Progesterone concentrations (Mean ± SE) in Nelore cows and heifers (ng/mL) at 3 moments: M1, 10 days before expected parturition, M2 and M3, 10 and 20 days post-partum, respectively.

<table>
<thead>
<tr>
<th>Groups</th>
<th>M1</th>
<th>M2</th>
<th>M3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cows (n=16)</td>
<td>4.15 ± 0.21ab</td>
<td>0.23 ± 0.11bc</td>
<td>0.43 ± 0.02ab</td>
</tr>
<tr>
<td>Heifers (n=15)</td>
<td>2.79 ± 0.15ab</td>
<td>0.49 ± 0.05ab</td>
<td>0.33 ± 0.03ab</td>
</tr>
</tbody>
</table>

Different superscript small letters in the same line differ; different superscript capital letters in the same column differ (T-test; p < 0.05).

Discussion

Progesterone plasma concentrations (4.15 ± 0.21 ng/mL) were similar to values described by Zeitoun et al. (1996), being lower than values described by Smith et al. (1973) for pre-partum cows (4.8 ± 0.6 ng/mL and 8 ng/mL, respectively).

The decrease on P4 concentrations at M2 and M3 are in agreement to values reported by Stabenfeldt et al. (1970), being attributed to luteolysis and fetal membrane losses and characterized by a gradual decrease during the last two weeks of gestation, dropping before parturition. However, the difference at M1 between cows and heifers can be possible explained by the smaller follicle diameter and consequent smaller CL size observed in heifers than in cows (Bó et al., 2003). Similarly to our findings, a large variation on plasma cortisol concentrations has been reported by Smith et al. (1973) at ten days post-partum when compared to pre-partum, not being represented by a significant difference. However, 12 hours before parturition a significant increase on serum cortisol concentrations was observed and it remained high until 12 hours post-partum, indicating a direct relationship with stress due to parturition.

The tendency on higher cortisol concentrations observed at M2 in heifers can be related to mammary gland development and beginning of lactation as described by Kitts (1985).

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Bibliografia


