

Testosterone, androstenedione, cortisol, triiodothyronine and thyroxine hormonal profile in neonate male buffaloes

(*Perfil hormonal de testosterona, androstenediona, cortisol, triiodotironina e tiroxina em búfalos recém-nascidos*)

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ABSTRACT

Basic aspects of the hormonal profile of five hormones were studied in neonate male buffaloes. The level of testosterone (T), androstenedione (A), cortisol (C), triiodothyronine (T3) and thyroxine (T4) were determined during the period of 1-6, 7-8, 9-12, 24, 48, 72 and 96 hours after parturition, using RIA solid phase technique. All hormones studied presented high levels in the neonate animals. The T and A levels were high in the first 1-6 hours post-partum, being 99.6 ± 66.6 and $1,301.4 \pm 887.7$ pg/ml, respectively. The T decreased sharply to basal levels (below the analysis limit of detection) within 24 hours while the A reached the basal level within 48 hours with 348.0 ± 279.4 pg/ml. The C and T4 levels were also high in the first 24-48 hours, which levels were 5.0 ± 3.2 and 11.1 ± 2.6 µg/ml, respectively, decreasing gradually and significantly ($P < 0.01$) until 96 hours post-partum, when they approached the basal levels (1.2 ± 1.5 and 7.2 ± 2.7 µg/ml, respectively). The concentration of T3 remained elevated during the entire period of sample collection with little variation ($P > 0.05$), with levels of 328.6 ± 130.8 and 294.5 ± 134.9 ng/dl, respectively during 1-6 hours and 96 hours after parturition.

Keywords: Buffalo, hormonal profile

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RESUMO

Alguns eventos endocrinológicos que ocorrem durante a vida fetal e/ou neonatal, de algum modo exerce influência ao longo da vida do animal, como por exemplo, a ação dos esteróides sexuais que atuam na diferenciação cerebral. Não obstante, os dados acerca do perfil hormonal em machos bubalinos recém-nascidos ainda são escassos. Em função desse fato, foi desenvolvido este trabalho com o objetivo de obter dados básicos sobre o perfil hormonal da testosterona, androstenediona, cortisol, T3 e T4 na referida espécie, sendo colhidas amostras de soro, no período de 1-6, 7-8, 9-12, 24, 48, 72 e 96 horas após o parto de dez búfalos recém-nascidos. As amostras foram analisadas pelo método de radioimunassay (RIA) em fase sólida. Todos os hormônios apresentaram alta concentração no recém-nascido, sendo altos os níveis de testosterona e androstenediona entre 1-6 horas, de $99,6 \pm 66,6$ e $1.301,4 \pm 887,7$ pg/ml, respectivamente. A testosterona decresceu rapidamente ($P < 0,05$) para o nível basal em 24 horas, o qual ficou abaixo do limite de detecção da análise, enquanto que a androstenediona atingiu níveis basais somente 48 horas após o parto, de $348,0 \pm 279,4$ pg/ml. Os níveis de cortisol e T4 apresentaram-se altos nas primeiras 24-48 horas, os quais foram de $5,02 \pm 3,22$ e $11,1 \pm 2,6$ µg/dl, respectivamente, decrescendo gradual e significativamente ($P < 0,05$), chegando próximos aos níveis basais no período de 96 horas após o parto, os quais foram de $1,18 \pm 1,52$ e $7,2 \pm 2,7$ µg/dl, respectivamente. Os níveis de T3 permaneceram elevados durante todo o período das colheitas ($P > 0,05$), ou seja $328,6 \pm 130,8$ no período de 1-6 horas e $294,5 \pm 134,9$ ng/dl na última amostra colhida 96 horas após o parto.

Palavras-chave: Búfalo, endocrinologia

INTRODUCTION

There is evidence that many endocrinological events occur during the fetal and/or neonatal period that will have some influence on the animal's life in the future. For instance, in rats two hours after parturition there is a peak in the testosterone level which seems to take part in the masculinization of the hypothalamus (Corbier et al., 1978). Such a peak will drive the sexual behavior of the adult male (Corbier et al., 1983). In the neonate male human being the peak of testosterone occurs about 3 to 12 hours after parturition (Corbier et al., 1990). In buffalo, Dwaraknath et al. (1984) reported high levels of cortisol and thyroxine in neonate animals. In spite of this evidence, the data about hormonal profiles in neonate male buffaloes are scarce so this study was carried out to observe basic aspects of the hormonal profiles of testosterone, androstenedione, cortisol, triiodothyronine and thyroxine in neonates of this species.

MATERIALS AND METHODS

Blood samples from the jugular vein of ten neonate male buffaloes (*Bubalus bubalis*) were collected during the period of 1-6, 7-8, 9-12, 24, 48, 72 and 96 hours after parturition. After the blood coagulated it was submitted to centrifugation at 1500g during 10 minutes to facilitate obtaining the serum samples which were separated in to five aliquots according to the number of hormonal analyses. The samples were kept frozen at -20°C until the time of analysis, which was done using solid phase RIA technic to determine the hormone profile of testosterone (T), androstenedione (A), cortisol (C), thyroxine (T4) and triiodothyronine (T3). No hormonal extraction was performed on testosterone and androstenedione hormones. The coefficient of variation intra assay and inter assay were 2.85 and 7.96 for T; 2.56 and 7.54 for C; 4.58 and 13.4 for T3; 4.68 and 5.79 for T4 and 1.95 and 13.6 for A, respectively.

RESULTS

The concentration of T in the blood of neonate male buffaloes was high in the first six hours (99.6 ± 66.6 pg/ml), however it had already started to decrease gradually and significantly ($P < 0.05$) at 7-8 hours, showing a concentration of 68.1 ± 56.7 pg/ml, and reached the basal level (22.3 ± 37.8 pg/ml) 24 hours after parturition. The concentration of T 48 hours after that was below the limit of analysis detection (Fig. 1). The A also demonstrated a high concentration in the first six hours ($1,301.4 \pm 887.7$ pg/ml) and started to decrease gradually after 9-12 hours, but such decrease was significant ($P < 0.05$) only after 48 hours (348.0 ± 279.4 pg/ml), reaching the basal level at 96 hours after parturition (199.2 ± 159.0 pg/ml) (Fig. 2). In relation to C and T4, high concentrations were also observed in the first six hours (5.02 ± 3.22 µg/dl, respectively) but started to decrease gradually and significantly ($P < 0.05$) at 9-12 hours after parturition, having concentrations of 3.96 ± 2.23 and 11.0 ± 2.4 µg/dl, respectively. At 96 hours, both C and T4 reached levels of 1.18 ± 1.52 and 7.17 ± 2.7 µg/dl, respectively. The C and T4 presented proportionately the same hormonal profile in the neonate male buffalo (Fig. 3).

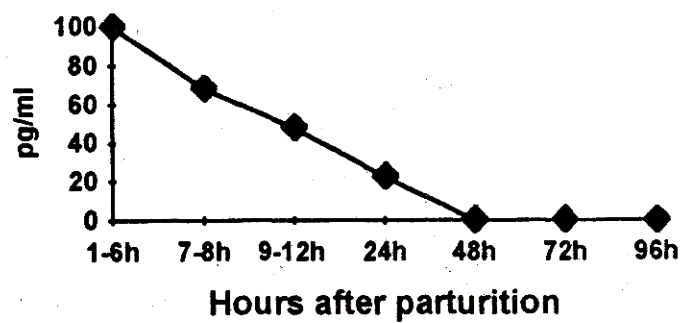


Figure 1. Level of testosterone in newborn male buffalo.

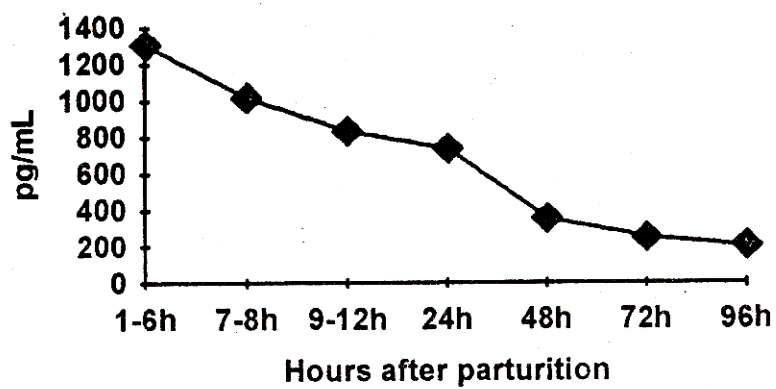


Figure 2. Level of androstenedione in neonate male buffalo in different hours after parturition.

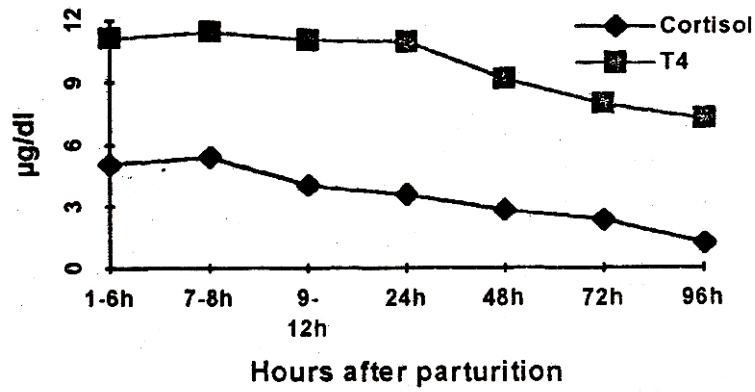


Figure 3. Level of cortisol and T4 in neonate male buffalo in different hours after parturition

The T3 was present in high concentrations during the whole period of collection with no significant difference ($P>0.05$) among the different times of sample collection, having a level of 328.6 ± 130.8 in the first 1-6 hours and 294.5 ± 134.9 ng/dl (Fig. 4) at 96 hours after parturition.

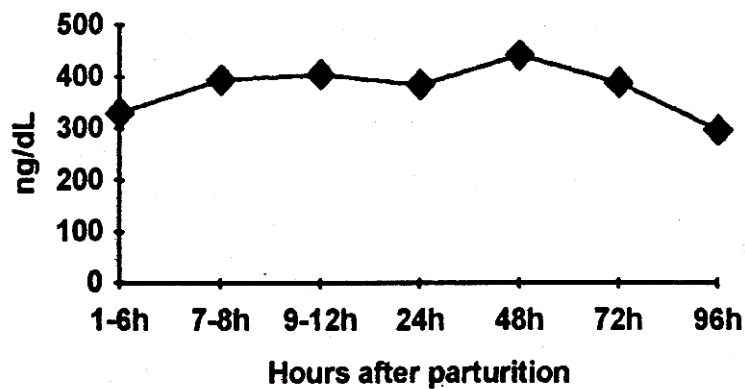


Figure 4. Level of T3 in neonate male buffalo in different hours after parturition.

DISCUSSION

The elevation in T level observed in neonate male buffaloes in the present work was also reported earlier (Dwaraknath et al., 1984; Sharma, et al., 1984) but that level was lower than that observed in the present work. This is because the above authors studied an animal up to one week of age, when the T might have already reached the basal level: in the present work, 24 hours after parturition the testosterone concentration had decreased to the basal level. In human beings the elevation in T level was observed between 3 - 12 hours (Corbier et al., 1990) and in rats in the first two hours (Corbier et al., 1978). The clinical-reproductive meaning of such elevation in the T level soon after parturition in buffalo is not known, however in rats, it is related to the masculinization of the hypothalamus (Corbier et al., 1978). In that animal this fact seems to influence the sexual behavior of the adult male (McDonald, 1989). In domestic animals, however, more studies are necessary to confirm the observation made on rats.

There are few references about the A level in neonate animals. In neonate human beings high levels of this hormone were observed which decreased in the first week of age (Forest & Cathiard, 1975). The function of this hormone and its source in the neonate buffaloes is not known.

The high levels of cortisol observed in the neonate male buffaloes also were reported earlier (Dwaraknath et al., 1984; Sharma et al., 1985). According to McDonald (1989) it is caused by increase in the activity of the adrenal of the fetus at the end of the gestation period, where it plays an important function in the mechanism of parturition. In addition, it seems that there is a relationship from a metabolic point of view, between C and T4 in the neonate animal since they presented a proportional profile during the first 96 hours after parturition (Fig. 3). In human beings there is evidence suggesting that glucocorticoids play a role in stimulating the conversion of T4 to T3 during the neonatal period (Ingbar & Woeber, 1981).

The high levels of T3 and T4 observed in the neonate male buffaloes was similar to the findings reported earlier by Sharma et al. (1985) and Silva et al. (1992). Such elevation seems to be caused by the cold to which the neonate is exposed when it leaves the uterine environment. According to Fisher & Klein (1981) and Ingbar & Woeber (1981), cold stimulates the secretion of TSH by the hypophysis, causing an increase in thyroid hormones. The influence of such hormones on the reproductive process in the buffalo is not clear. However, it has been demonstrated that in rats, hypothyroidism during the first 25 days of life

caused an increase in testis size and in sperm production (Cooke & Meisame, 1991; Cooke et al., 1991). It is evident that knowledge about the reproductive physiology involving such hormones in the neonate male buffalo is scarce, so more studies are necessary to see if such hormones have some correlation and influence on the reproductive function in the adult male buffalo.

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