

## TESTOSTERONE CONCENTRATION IN BLOOD SERUM OF BUFFALO BULLS DURING 24 HOURS IN WINTER AND SUMMER SEASONS\*

### CONCENTRAÇÕES DE TESTOSTERONA NO SORO SANGÜÍNEO DE BÚFALOS DURANTE 24 HORAS, NO INVERNO E NO VERÃO

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#### SUMMARY

Testosterone concentration was measured by radioimmunoassay in 30 samples of blood serum obtained five times at each 6 hour's interval during 24 hours from 6 Jaffarabadi x Mediterranean buffalo bulls. Blood samplings were carried out twice, respectively, in one day of summer and one day of winter season. Testosterone concentration ranged from 0.10 to 1.36 ng/ml in the winter day and from 0.10 to 2.54 ng/ml in the summer day. Maximum values were obtained at 6:00 p.m. (0.52) in summer and 0.82 ng/ml in winter, then abrupt drops occurred, first at 12 m. (0.37) in summer and 0.21 in winter, and the second one at 24 p.m. (0.17) in summer and 0.49 ng/ml in winter. In summer, higher serum testosterone levels were observed during the day.

**UNITERMS:** Testosterone; Serum; Buffaloes

#### INTRODUCTION AND LITERATURE

Females have been known to have a cyclic release of reproductive hormones depending on the phase of reproduction of an individual. In recent years, rhythmic secretion of a number of hormones has been demonstrated in the male, although a few species differences have also been identified. Circadian rhythm has been documented for plasma testosterone levels in men, monkeys, laboratory animals, stallions, rams and bulls.

There is not much information on buffalo bulls concerning the episodic release of testosterone, except for some papers from Sri Lanka and India.

PERERA et al.<sup>5</sup> (1979) reported that in Sri Lanka testosterone concentration in Murrah buffaloes varies during the year. Also in that country, GUNARA JASINGAM et al.<sup>4</sup> (1985) conducted studies to determine the 24-hour fluctuations in blood serum testosterone concentration in three adult buffalo bulls, a Murrah, a Surti and a local breed.

In India, CHANTARAPRATEEP et al.<sup>2</sup> (1981) studied the circadian variation of plasma LH and testosterone in adult swamp buffalo bulls. AGARWAL et al.<sup>1</sup> (1983) studied hourly serum samples from four 5 to 6 years old adult Murrah buffalo bulls. Studies by DIXIT et al.<sup>3</sup> (1985) in 15 breeding male Murrah buffaloes showed significantly lower values for testosterone during winter ( $0.53 \pm 0.06$  ng/ml) than during summer ( $1.22 \pm 0.19$  ng/ml).

In available Brazilian literature, there is not much information about testosterone concentration on buffaloes. Therefore the objectives of the present work were to establish data on the serum testosterone levels in specimens of Jaffarabadi x Mediterranean buffalo bulls reared in this Country. For this purpose, the following topics of research were carried: out 1) to study 24 hour fluctuation in serum testosterone levels; 2) to provide information regarding testosterone profiles in one day of two seasons of the year, winter and summer and 3) to study the variation in testosterone profiles during the day and the night.

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## MATERIAL AND METHOD

Six Jaffarabadi x Mediterranean buffalo bulls, 3 to 4 years old, were used in this study. The bulls were reared in paddocks near the laboratory. The bulls were apparently healthy and had normal external genitalia. Jugular blood was collected into 10 ml Vacutainer tubes, at 6 hours intervals, starting at 6 a.m. up to 6. a.m. of the following day. Thus, 5 samples were collected from each animal. Samples from the six animals were collected concurrently on the same day. The study was conducted in June 30, 1991 (winter) and again in December 30, 1991 (summer). Blood serum was obtained following 600 g refrigerated centrifugation during 10 minutes at 4°C and stored at -20°C until assayed. Blood serum samples were analysed for testosterone by radioimmunoassay according to SMITH; HAFS<sup>6</sup> (1973).

For statistical analysis, months were considered as two distinct seasons and the overall mean testosterone values for two seasons were compared using a Student's "t" test. During each season, the testosterone concentration observed was split into two periods from 6 a.m. to 12 a.m. (day) and from 18 p.m. to 24 p.m. (night) and the averages also compared using the Student's "t" test.

## RESULTS AND DISCUSSION

The mean serum testosterone profiles of the six buffalo bulls in June and December 1991 are shown in Fig. 1. Testosterone concentration ranged from 0.10 to 1.36 ng/ml during the 24-hour sampling period in winter time and from 0.10 to 2.54 ng/ml in summer time.

As can be seen in Tab. 1, maximum values were obtained at 6 a.m. ( $0.52 \pm 0.36$  ng/ml in summer and  $0.82 \pm 0.49$  ng/ml in winter), then abrupt drops occurred at 12 m. ( $0.37 \pm 0.52$  ng/ml in summer and  $0.21 \pm 0.17$  in winter) and at 24 p.m. ( $0.17 \pm 0.19$  ng/ml in summer and  $0.49 \pm 0.35$  ng/ml in winter).

All six bulls exhibited two well-defined episodic peaks. Taking into consideration all the bulls together, one peak occurred in the morning at 6 a.m. and a second one occurred in the afternoon at 6 p.m. CHANTARAPRATEEP et al.<sup>2</sup> (1981) reported one to ten peaks with an average testosterone concentration of 0.1, 0.33 and 0.55 ng/ml for three adult swamp buffalo bulls, while AGARWAL et al.<sup>1</sup> (1983) observed three episodic peaks with an average testosterone varying from 0.30 to 3.50 ng/ml. Number of peaks observed in this study does not agree with those reported above. This variation may be due to differences in climatic conditions, management practices, breeds, frequency and method of

sampling and calculation of hormone peaks. However, the testosterone levels are comparable with the results of PEREIRA et al.<sup>5</sup> (1979), CHANTARAPRATEEP et al.<sup>2</sup> (1981), GUNARAJASINGAN et al.<sup>4</sup> (1985) and DIXIT et al.<sup>3</sup> (1985).

The low testosterone concentrations in adult buffaloes observed in this study are in agreement with previous findings by PEREIRA et al.<sup>5</sup> (1979) and DIXIT et al.<sup>3</sup> (1985).

In agreement with AGARWAL et al.<sup>1</sup> (1983), we were able to find significant differences in serum testosterone concentration when assayed in winter and in summer. Lower values occurred in the samples collected during the summer, a finding that may be due in part to the season's high temperatures. The heat stress in buffaloes is further aggravated by the animal's poor heat-dissipating mechanism due to fewer sweat glands per unit area of skin. Nevertheless, studies by DIXIT et al.<sup>3</sup> (1985) showed significantly lower values for testosterone during winter than during summer.

In this study, significantly higher blood serum testosterone levels were obtained during day time in summer, but not in winter. Also, GUNARAJASINGAM et al.<sup>4</sup> (1985) found significantly higher blood serum testosterone levels during

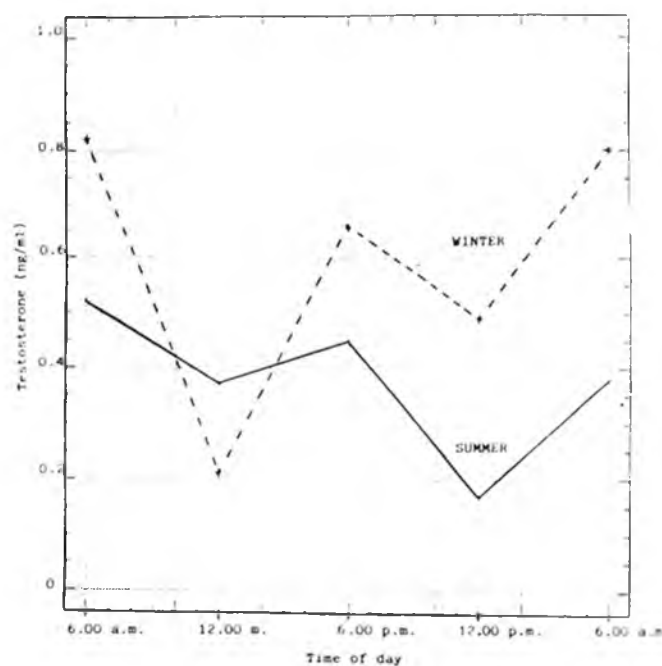


FIGURE 1

Blood serum testosterone concentration in buffalo bulls during 24 hours, in summer and winter.

day time in summer. However, CHANTARAPRATEEP et al.<sup>2</sup> (1981) failed to record any diurnal variation in testosterone secretion in local swamp buffaloes.

### CONCLUSION

From these studies, it may be concluded that blood serum testosterone concentration in buffalo bulls varies with season and the time of day. In spite of not having been found high values, as reported in other species, an episodic release of testosterone has been observed.

TABLE 1

Mean blood serum testosterone concentration (ng/ml) in buffalo bulls. Vale do Ribeira - SP, June-December, 1991.

SEASON	SAMPLING				
	6:00 a.m.	12:00 m.	6:00 p.m.	12:00 p.m.	6:00 a.m.
Summer	al			2	al
	0.52 ± 0.36	0.37 ± 0.52	0.45 ± 0.48	0.17 ± 0.19	0.38 ± 0.30
Winter	bl	2			bl
	0.82 ± 0.49	0.21 ± 0.17	0.65 ± 0.60	0.49 ± 0.35	0.80 ± 0.35
a # b					#
1 # 2					p < 0.05

### RESUMO

Concentrações de testosterona foram determinadas por radioimunoensaio em 30 amostras de soro sanguíneo obtidas cinco vezes durante 24 horas, de 6 búfalos adultos Jaffarabadi x Mediterrâneo. As amostras foram obtidas durante um dia do inverno e um dia do verão de 1991. As concentrações de testosterona variaram de 0,10 a 1,36 ng/ml no inverno e de 0,10 a 2,454 ng/ml no verão. Valores máximos foram obtidos às 6,00 horas (0,52 ng/ml) no verão e 0,82 ng/ml no inverno, ocorrendo então duas quedas abruptas, a primeira às 12 horas (0,37 ng/ml) no verão e 0,21 ng/ml no inverno e a segunda 24 horas (0,17 ng/ml) no verão e 0,49 ng/ml no inverno. No verão, níveis mais altos de testosterona sérica foram observados durante o dia.

UNITERMOS: Testosterona; Soro; Búfalos

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