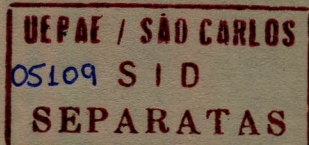


THE ESTABLISHMENT OF PUBERTY IN ZEBU BULLS OF THE NELLORE BREED  
RAISED IN CENTRAL BRAZIL

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RESUME

Chez le taureau zébu de race Nelore au Brésil central. l'âge moyen à la puberté (50 x 10<sup>6</sup> spermatozoïdes avec plus de 10% de mobiles) est de 658±22 jours et le poids de 333±11 kg. Les circonférences scrotale et thoracique à la puberté sont 26,9±0,9 cm et 170±2 cm. Le coefficient de corrélation entre les poids et les diamètres testiculaires est de 0,89 et entre les diamètres thoraciques et l'âge à la puberté de 0,90 (P<0,01). La circonférence scrotale présente une relation quadratique,  $y = 4,02 + 0,0002 A - 0,0002 A^2$  (P<0,01) avec l'âge à la puberté. Le volume moyen de l'éjaculat à la puberté, récolté par électroéjaculation est de 4,0±0,5 ml et la concentration moyenne de 25,0±3,8 x 10<sup>6</sup> spermatozoïdes avec 64±0,5 cellules mobiles. Le pourcentage des spermatozoïdes anormaux à la puberté est de 61%. Les pourcentages de spermatozoïdes avec des anomalies majeures, mineures ou totales à la puberté sont respectivement de 55,0±4,73, 2,5±0,37 et 57,5±3,5. Les anomalies les plus fréquentes concernent la gouttelette proximale, 40%, le flagelle, 10,9% et la tête 2,5%. Il existe une corrélation positive entre le volume de l'éjaculat, le poids et l'âge à la puberté (P<0,001). Le niveau moyen du zinc, des phosphatases alcaline et acide dans le plasma séminal est 6,8,1±4,6 U/l et 168±58 U/l respectivement. Le zinc a été corrélié avec les anomalies de tête (P<0,01). Les données mettent en évidence que : a) les taurillons zébu Nelore, élevés sur pâturage en milieu tropical (alternance d'une saison chaude et d'une saison fraîche) sont pubères seulement après 21,9 mois et b) les éjaculats obtenus par électroéjaculation possèdent largement les caractéristiques d'un sperme capable d'être congelé.

INTRODUCTION

Puberal characteristics in Zebu cattle (*Bos indicus*) have been described by Oyedipe et al. (1981). Little information is available on the Nelore breed, where Cardoso et al. (1979) found spermatozoïdes in the seminiferous tubules starting at 15 months.

We present the age and weight at puberty for Nelore bulls, under tropical extensive raising conditions, which will permit the developing of efficient systems of herd management.

MATERIAL AND METHODS

The study was conducted at the National Center for Beef Cattle Research located in Mato Grosso do Sul State, a tropical region of Central Brazil, where the climate (T°, rainfall and day length) is characterized by a dry season with means of 20,9±0,85°C, 34,7±13,2 mm and 10,7±1,7 h (June to September) and a rainy season with 23,5±0,78°C, 208,3±57,3 mm and 13,3±2,0 h (October until April), respectively.

Twelve weaned Nelore (*Bos indicus*) bulls were selected within their genotype and maintained on *Brachiaria brizantha* pasture, receiving salt (NaCl) ad libitum. The animals were evaluated monthly from 7 to 24 months of age for scrotal and body development, and biweekly

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as from 9.5 months of age for production and morphological characteristics of the semen, collected by electroejaculation. The seminal plasma was examined for zinc (Kavanach, 1983) and alkaline and acid phosphatases (Tastaldi, 1967) concentrations.

The puberty onset was recognized when each animal attained an ejaculate containing more than  $50 \times 10^6$  spermatozoa with at least 10% motility (Wolf et al., 1965).

## RESULTS

The means of the parameters studied are presented in Table 1.

Significant correlation was observed between age at puberty (A) scrotal circumference (SC) (.91), body weight (BW)(.78), thorax circumference (TC)(.91) and motility (MO)(-.73)( $P < .001$ ).

Scrotal circumference at puberty was correlated with BW (.89)( $P < .01$ ), TC (.74) and total sperm ejaculate (TSE)(.26)( $P < .001$ ). SC showed a quadratic relationship with ( $P < .001$ ) ( $y = 4.02 + .0002 (A) + .0002 (A^2)$ ).

The body weight was correlated with volume (.72)( $P < .001$ ) and MO (-.59)( $P < .01$ ) and TSE with abnormal spermatozoa (ABS)(-.61)( $P < .01$ ) and seminal zinc with head defects (HD)(.67)( $P < .01$ ).

## DISCUSSION

In this study the age at puberty was later than reported for Charolais (Barber and Almquist, 1975), Brahman (Fields et al., 1982) and African *Bos indicus* bulls (Oyedipe et al., 1981). This delay is possibly a reflection of poor nutrition through the dry and cold season, exactly during the prepuberal period. Despite the apparent effect of nutrition, 25% of the bulls presented the first mobile spermatozoa at 16 months and 50% at 18 months and the body weight at puberty was higher than found by Oyedipe et al. (1981). This would suggest that not only nutritional factors determine the onset of puberty, but also genotypes and climate factors such as temperature (Heyman, 1975).

The scrotal circumference of Nellore bull at puberty was smaller to that of Brahman (Fields et al., 1982) and similar to values reported by Lunstra et al. (1978). The SC increases as body weight and age increase, as reported by Fields et al. (1982). The body weight factor is nutritionally dependent (Courot, 1971), showing its importance on testes development. In addition, the rate of testicular growth has been shown to be related to earlier puberty. These characteristics may therefore be useful in the selection of beef bulls for early sexual maturity (Lunstra et al., 1978). The intensive growth of testes occurred between 12 and 18 months of age. These data suggest that selection could be made during this period.

The SC was also correlated with thorax circumference, so this last parameter could be used for evaluating testicular growth.

The ejaculate volume was directly related to body weight at puberty as found by Wildeus et al. (1984). Since all the bulls were maintained under same nutritional condition no direct



conclusion as to its effect on sperm production can be drawn.

The total sperm ejaculate was correlated with SC and ABS. These relationships observed during the experiment reflect the immaturity of the bulls at first observation and subsequent increase in sperm production potential with age.

The sperm morphology during the prepuberal period was characterized by a linear decrease in percentage of abnormal spermatozoa, particularly sperm tail abnormalities (18.0 to 10.0%), such as observed by Lunstra and Echterkamp (1982).

Seminal zinc and phosphatases concentrations increased during the prepuberty period until puberty. These results indicate that the above ejaculate characteristics follow the sexual development.

The negative correlation of seminal zinc with HD, as observed by Wallace and Calvin (1981), would suggest that nutrition may influence seminal plasma zinc concentrations.

The results obtained in this study confirm the delay of onset of puberty in Nellore bulls (*Bos indicus*), when compared to *Bos taurus* breeds, probably as a consequence of genotype and the tropical environmental conditions.

#### REFERENCES

- Barber, K.A. and Almquist, G.D., 1975. Growth and feed efficiency and their relationship to prepuberty traits of charolais bulls. *Anim. Sci.*, 40(2):288-301.
- Cardoso, F.M. and Godinho, H.P., 1979. Morphological events occurring in the seminiferous tubules of the brazilian Nellore zebu associated with puberty. *Anot. Anz.*, 145:262-67.
- Courot, M., 1971. Établissement de la spermatogénèse chez l'agneau (*Ovis aries*). Étude expérimentale de son contrôle gonadotrope; importance des cellules de la lignée sertolienne. D.Sc. Thesis, Univ. Paris, Paris.
- Fields, M.G., Hengtyes, J.F. and Calenisse, K.W., 1982. Aspects of the sexual development of Brahman. *Theriogenology*, 18(1):17-30.
- Heyman, Y., 1975. Incidence des facteurs climatiques sur la reproduction des bovins. Resultats d'élevage en Guadelupe. *Nouv. Agron. Antilles - Cayenne*, 1:199-212.
- Kavanach, J.P., 1983. Zinc binding properties of human prostatic tissue, prostatic secretion and seminal fluid. *J. Reprod. Fert.*, 68:359-63.
- Lunstra, D.O. and Echterkamp, S.E., 1982. Puberty in beef bulls acrossome morphology and semem quality in bulls of different breeds. *J. Anim. Sci.*, 55:638-48.
- Lunstra, D.O., Ford, G.G. and Echterkamp, S.E., 1978. Puberty in beef bulls: Hormone concentrations, growth, testicular development sperm production and sexual agressiveness in bulls of different breeds. *J. Anim. Sci.*, 46:1054-61.
- Oyedipe, E.O., Kumi-Diaka, J. and Oseri, D.I.K., 1986. Determination of onset of puberty in zebu bulls under tropical conditions of northern Nigéria. *Theriogenology*, 16:419-31.
- Tastaldi, H., 1965. *Práticas de bioquímica*. Ed. Universidade São Paulo, São Paulo, Vol.II, 7ª ed., 249p.
- Wallace, E. and Calvin, H.I., 1981. Effects of zinc deficiency on the development of rat spermatozoa. *Biol. Reprod.*, 24(suppl. 1):81A.