



SHORT COMMUNICATION

Endocrine Status of Serum Testosterone, Estrogen and Thyroid Hormones in High Fertility Breeding Buffalo Bulls and their Male Calves

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ABSTRACT

The present study was conducted to assess the endocrine status of serum testosterone, estradiol and thyroid hormones in good fertility breeding buffalo bulls and their male calves. Fifteen buffalo bulls were categorized into good fertility bulls on the basis of semen evaluation and reproductive history. Thirty one male calves were selected from these fifteen buffalo bulls. Average testosterone concentration was higher ($p < 0.05$) in adult buffalo bulls than male calves (2.93 ± 0.44 ng/ml versus 1.20 ± 0.35 ng/ml). Similarly estradiol concentration in adult buffalo bull was ($p < 0.05$) higher (51.66 ± 2.54 pg/ml) as compared to male calves (15.352 ± 2.47 pg/ml). Serum TSH was found higher ($p < 0.05$) in adult buffalo bulls (18.83 ± 4.15 μ IU/ml) than their male calves (7.08 ± 2.48 μ IU/ml) but serum concentrations of T3 and T4 were similar in adult buffalo bull and their male calves (5.84 ± 0.60 ng/ml and 4.96 ± 0.52 μ g/dl versus 3.73 ± 0.38 ng/ml and 3.34 ± 0.29 μ g/dl, respectively)

Keywords: Buffalo bulls, endocrine status, fertility

India inhabits 55 million breedable buffaloes of which approximately 10% are bred through artificial insemination. In order to supply the required doses of frozen semen straws, approximately 500 fertile buffalo bulls are needed every year to replace older buffalo bulls (NDDB 2015). For selecting the buffalo bulls with good genetic potential, young male calves are recruited on the basis of dam's milk yield, breed characteristics and physical conformation. These male calves are reared until puberty and then evaluated for their sexual and reproductive traits. It has been observed that 81.05% of Murrah bulls produce freezable semen (Mukhopadhyay *et al.*, 2010). It clearly indicates that 20% of buffalo bulls are rejected due to poor semen quality which causes a huge loss in terms of rearing cost. Studies on adult buffalo bulls have shown that various traits affect semen quality and fertility. However endocrine profile is also very important. Preliminary studies on bull calves endocrinology suggest that puberty, physical parameters and sexual interest in bull calves depends upon its endocrine status (Ahmed *et*

al., 1985). So present study was planned to establish the relationship between endocrine profile of adult buffalo bull and their male calves.

MATERIALS AND METHODS

Present study involved a total of fifteen breeding buffalo bulls (4-6 years of age) and their male calves ($n=31$; 3-6 months) maintained at bull station, GADVASU (Ludhiana) and 5 private dairy farms, Punjab. All the bulls and their male calves were injected 20 μ g (5 ml) of GnRH (Buserelin acetate, Receptal, Intervet) intramuscularly. Three Blood samples at interval of 15 minutes were collected following 3 hrs of GnRH injection. Microwell ELISA kits (96 wells) were used for estimation of serum levels of testosterone, estradiol (DIA source Immunoassay, S.A., Belgium) and thyroid hormones (Benesphera, Avantor Performance Materials India Limited, Dehradun, Uttarakhand). The hormone assay was conducted as per the protocols and guidelines of the manufacturer.

Statistical analysis

Data was expressed as Mean \pm SEM using IBM SPSS statistics 21.0 windows. Serum levels of testosterone, estradiol, TSH, T3 and T4 were compared using student's t-test.

RESULTS AND DISCUSSION

Testosterone, estradiol and thyroid hormone concentration in serum of adult buffalo bull and their male calves are presented in table 1. In our study testosterone concentration was higher ($p < 0.05$) in adult buffalo bulls than male calves (2.93 ± 0.44 ng/ml versus 1.20 ± 0.35 ng/ml). Leydig cells in testis produce testosterone which is largely responsible for development and maintenance of male reproductive tract. Similar observations were reported by Hemeida *et al.* (1985). They observed that in serum testosterone concentrations were very low (18.0 ± 2.9 pg/ml) in buffalo bull calves at birth and remained low up to 8 months of age. The first significant increase in serum testosterone occurred at 8-9 months of age. Similarly Singh *et al.* (2015) found serum concentrations of 4.08 ± 0.61 and 3.58 ± 0.47 ng/ml in good and poor libido buffalo bulls respectively.

Table 1: Serum levels of testosterone, estradiol, TSH, T3 and T4 in adult buffalo bulls and their male and male calves

Parameters	Adult buffalo bull (n=15)	Calves (n=31)
Estrogen (pg/ml)	$51.66 \pm 2.54^*$	15.352 ± 2.47
Testosterone (ng/ml)	$2.93 \pm 0.44^*$	1.20 ± 0.35
T3 (ng/ml)	5.84 ± 0.60	4.96 ± 0.52
T4(ug/ml)	3.73 ± 0.38	3.34 ± 0.29
TSH (μ IU/ml)	$18.83 \pm 4.15^*$	7.08 ± 2.48

*Means bearing different superscripts differ significantly ($p < 0.05$) within the row

In our study estradiol concentration in adult buffalo bulls was higher ($p < 0.05$) (51.66 ± 2.54 pg/ml) as compared to male calves (15.352 ± 2.47 pg/ml). Testosterone is converted to estradiol by aromatization in sertoli cells, adipose tissues and hypothalamic pre-optic area. Increased aromatization of testosterone to estradiol causes decreased testosterone to estrogen ratio. Increased concentration of estradiol can affect fertility as testosterone and estradiol

are negatively correlated to each other (Javed *et al.*, 2000). Certain amount of estradiol is required for the function of postpubertal bull testes and to regulate sperm motility (Devkota *et al.*, 2008). Ahmed *et al.* (1985) studied that serum estradiol levels increased during the early part of prepubertal development attaining a mean concentration of 27 ± 3 pg/ml at 5 months of age and remained more or less unchanged until the age of 15 months.

In our study serum TSH found in adult buffalo bull was higher ($p < 0.05$) 18.83 ± 4.15 μ IU/ml than their male calves which was 7.08 ± 2.48 μ IU/ml). Thyroid gland plays a significant role in fertility of buffalo bulls as it directly controls the basal metabolic rate of body. TSH is positively correlated to testosterone secretion (Brown *et al.*, 2007) and as threshold concentration of testosterone is required for sexual activity, severe decrease in circulating level of TSH can lead to poor fertility. Serum concentrations of T3 and T4 were similar in adult buffalo bull and their male calves (5.84 ± 0.60 ng/ml and 4.96 ± 0.52 μ g/dl versus 3.73 ± 0.38 ng/ml and 3.34 ± 0.29 μ g/dl, respectively). Ingole *et al.* (2012) investigated the serum thyroid patterns in female Murrah buffalo calves and heifers from birth to puberty. The concentration at the age of attaining the puberty, was about 3 – 4 times higher than recorded at birth but the T4:T3 ratio recorded at different ages did not exhibit specific trend.

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