STUDIES ON THE THYROID PROFILE (T₃, T₄ AND TSH) IN ESTROUS, CYCLIC AND ANOESTROUS BUFFALOES

Raja Kumar P.¹, Lakshmana Swamy P.¹, Aswani Kumar K.¹ and Somasekhara Rao K.²

ABSTRACT

In the present study, serum concentrations of the thyroid profile (T₃, T₄ and TSH) were estimated in normal cyclic, estrous and anoestrous buffaloes. The heifers, both in estrous and anoestrous, were in the age range from 16 months to 24 months, and the cyclic buffaloes were aged 3-6 years. The method adopted for the estimation was the EIA method. The T₃ values observed were 3.179±1.660, 2.936±1.260 and 2.238±0.912, The T₄ values observed were 5.920±1.963, 5.093±1.614 and 5.500±1.208, and the TSH values were 0.035±0.059, 0.038±0.030, and 0.014±0.025 in estrous, cyclic and anoestrous buffaloes, respectively. The overall thyroid diagnosis in estrous was 47%, in cyclic, 34%, and in anoestrous, 19%. The occurrence of the thyroid profile in controls and anoestrous varied significantly. The thyroid profile was low in anoestrous buffaloes when compared with the controls. The variation ranged about 15-18% between controls and anoestrous buffaloes.

Keywords: anoestrous, estrous, cyclic, heifer, thyroid profile, reproductive activity

INTRODUCTION

Endocrinology has the important position of being able to correlate anatomy, physiology, genetics and biochemistry (LE Mc Donald et al., 1985). The thyroid gland is very important in governing various body functions. The hormones T₄ and T₃ and calcitonin (CT) are related with maintenance of BMR and growth. Low levels of T₄ and T₃ are related with delayed puberty and reproductive disorders, so the levels of thyroid hormones are important in the reproductive activity of the animals (Chandra Sekhar et al., 1985). The reproductive performance is very poor primarily because there is a high incidence of anoestrus (63-83%) especially during summer which has been attributed to heat stress together with an overriding effect of nutritional deficiencies owing to scarcity of green fodder. Negative energy balance (NEB) decreases circulatory concentrations of glucose, insulin and insulin-like growth factor (IGF-I), leading to increased losses of body condition score (BCS) and higher incidence of anoestrous in cows and buffaloes. Abnormalities in reproduction are common when breeding animal develops hypothyroidism. Lack of libido and reduction in sperm count occurs in males, whereas abnormal or absent estrus cycles with reduced conception rates may result in females. Obesity and changes in behavior resulting from hypothyroidism often have detrimental effects on reproduction. Iodine deficiency is a health problem of considerable magnitude in India. A minimum of 60 μg of elemental iodine per day is required for thyroid hormone synthesis. Thyroid disorders are more common in female than in male animals.

¹Department of Veterinary Biochemistry, NTR College of Veterinary Science Gannavaram, Krishna (Dt)-521102, Andhra Pradesh, India
²Acharya Nagarjuna University PG Centre, Nuzvid-521201, Andhra Pradesh, India
Measurement of TSH is more reliable in the diagnosis of thyroid hormone abnormalities than the measurement of thyroid hormone levels. A sensitive TSH assay is now an accepted initial screening test of thyroid function. $T_4$ and $T_3$ circulate in the blood as equilibrium mixtures of free and protein bound hormones. Carrier proteins bind 99.97% of $T_4$ and 99.7% of $T_3$. Only a small fraction of the total is free and physiologically active (Carl et al., 2000). Enzyme immunoassays (EIA) are rapid and provide a high degree of specificity and sensitivity over the traditional radioimmunoassays (RIA). Immunometric assays offer not only improved sensitivity for TSH measurement but also rapid turnaround time and a wide linear measurement range as compared with RIA methods (Odell et al., 1965). There is no previous study on the thyroid profile of cattle or buffaloes. The values obtained from this study of cyclic and estrous buffaloes are considered as control values with which to compare anoestrous values.

**MATERIALS AND METHODS**

The present study was conducted from September 2006 to August 2007. During this period, buffaloes brought to veterinary hospitals of rural areas were selected. The present study comprised a total of 126 buffaloes, out of which 50 heifers ranging in age from 12-18 months were in anoestrous and 50 heifers (aged from 12-18 months) were in estrous, and 26 buffaloes were cyclic (aged from 3-6 years) and active in their reproductive performance were used as controls. The buffaloes are selected after thorough examination by per rectal palpation of internal genitalia and ovaries. The buffaloes with thyroid disorders were excluded. A sample of 5 ml of blood was withdrawn from the each buffalo and the serum samples were stored at 2-8°C. The serum samples were analyzed for $T_3$, $T_4$, and TSH by using an EIA kit (VEDA LABS Product number T 012).

A monoclonal antibody to thyroid hormones ($T_3$, $T_4$, and TSH) was immobilized on the micro wells. A purified ($T_3$, $T_4$, and TSH) polyclonal antiserum conjugate to the enzyme horseradish peroxide was used to detect $T_3$, $T_4$, and TSH in the given serum samples. For the measurement of $T_3$, $T_4$, and TSH, the EIA method was employed (Odell et al., 1965).

For TSH concentration, a standard curve was prepared by plotting the average absorbance values against the concentration of the standards in μIU/ml on a linear-log graph paper using the mean absorbance value for each sample. The concentration of TSH in μIU/ml was determined from the standard curve (Odell et al., 1965).

For $T_3$ concentration, % A/AO was calculated for each standard and test sample by dividing the average absorbance (A) of each standard and test sample by the average absorbance (AO) for the 0 ng/dl standard and multiplying by 100. A standard curve was prepared by plotting the % A/AO for standards against the concentration of the standards on linear-log graph paper. Using the % A/AO value for each sample, the concentration of $T_3$ in ng/dl is determined from the standard curve (Cavalieri et al., 1977).

For $T_4$ concentration, the average absorbance (A) of each standard and test sample was divided by the average absorbance (AO) for the 0 μg/dl standard and multiplied by 100 to give % A/AO for each sample and standards. A standard curve was prepared by plotting the % A/AO for standards against the concentration of the standards on linear-log graph paper. Using the % A/AO value for each sample the concentration of $T_4$ in μg/dl was determined from the standard curve (Evered et al., 1976).
RESULTS AND DISCUSSION

The values of T₃ in the present study were as follows: 3.179±1.660 ng/ml, 2.238±0.912 ng/ml, and 2.936±1.26 ng/ml estrous, anoestrous and cyclic buffaloes. The T₃ values were lower in the anoestrous heifers than in the controls, so it was concluded that the thyroid-stimulating hormone can regulate the secretion of the triiodothyronine, T₃, in low levels leads to hypothyroidism in the anoestrous buffaloes. For the expression of the estrous condition, normal levels of T₃ are required. So, low levels of T₃ can depress the reproductive performance in the buffaloes. The values of T₃ in the present study in estrous, anoestrous and cyclic buffaloes were 5.920±1.963 µg/dl, 5.500±1.208 µg/dl, and 5.930±1.614 µg/dl, respectively. The T₄ values were also lower in the anoestrous than in cyclic buffaloes and estrous buffaloes, but these values were very close in these three cases when compared with the T₃ and TSH values.

The TSH values observed were 0.035±0.059, 0.038±0.030 and 0.014±0.025, in estrous, cyclic and anoestrous buffaloes, respectively.

The anoestrous condition is generally seen as 65.9% in winter, 59.75% in spring, 55.99% in summer, 57.38% in the rainy season and 66.73% in autumn, and as 48% the entire year. In heifers generally the reproductive problems are 23.53% in all the seasons, and they may gradually decrease by calving status of the buffaloes. (1st calving 18.86%, 2nd calving 18.19% and > 3rd calving 13.02%)

The table represents the thyroid profile of the estrous, cyclic and anoestrous buffaloes. These values were obtained by the use of biostatistical formulae i.e. mean ± SD. The overall thyroid profile diagnosis in anoestrous was 19%, in estrous 47%, and in the controls, are 34%. The thyroid profile was low in anoestrous buffaloes when compared with the controls. The variation between controls and anoestrous buffaloes ranged 15 to 28%. The maximum anoestrous was due to low protein and other nutrients in the diet. The range of thyroid profile, according to the RIA method the values obtained for normal and reproductively inactive animals were similar in level, but it was concluded that there was little variation between the thyroid profiles of normal and anoestrous buffaloes. Finally, the buffaloes provided a good environment, highly nutritious feed, and thyroid hormonal ingestion give good results in reproduction.

Table. The mean concentrations of thyroid profile of estrous, cyclic and anoestrous buffaloes with standard deviation.

<table>
<thead>
<tr>
<th>Thyroid Profile</th>
<th>Estrous (50)</th>
<th>Cyclic (26)</th>
<th>Anoestrous (50)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSH in µ IU / ml)</td>
<td>0.035±0.059</td>
<td>0.038±0.030</td>
<td>0.014±0.025</td>
</tr>
<tr>
<td>T₃ in ng/ml</td>
<td>3.179±1.660*</td>
<td>2.936±1.260*</td>
<td>2.238±0.912</td>
</tr>
<tr>
<td>T₄ in µg / dl</td>
<td>5.920±1.963*</td>
<td>5.918±1.392*</td>
<td>5.500±1.208*</td>
</tr>
</tbody>
</table>

Mean ± SD at * P<0.05-statistical significance compared.
Figure 1. Thyroid profile in estrous buffaloes.

Figure 2. Thyroid profile in cyclic buffaloes.

Figure 3. Thyroid profile in anoestrous buffaloes.
Figure 4. Thyroid profile in estrous, cyclic, and anoestrous buffaloes.

Figure 5. %Thyroid profile in estrous, cyclic, and anoestrous buffaloes.
REFERENCES


Chandra Sekhar et al. 1985 and Brooks et al. 1964. (research article).


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