HORMONAL INDUCTION OF PUBERTY AND SUBSEQUENT REPRODUCTIVE PERFORMANCES IN INDIGENOUS HEIFERS OF ASSAM

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ABSTRACT

Ten prepubertal indigenous heifers of Assam aged 20 to 24 months were taken in the present study to induce puberty and were treated with “Crestar” ear implant, “Crestar” injection and “Folligon”. Another ten heifers of similar age and body weight were placed in control group. All the treated heifers were induced to oestrus after 29.10±0.90 hr of implant removal. However, none of the control heifers exhibited oestrus till 120 days, the period of study. The mean duration of induced oestrus was 67.50±1.44 hr, the percentage of ovulation being 70.00. Subsequently, all the heifers of the treatment group (100%) exhibited first natural oestrus with cyclic period of 22.00±0.86 days and oestrus duration of 23.60±3.84 hr with ovulation occurring in 50% animals. Eight out of 10 (80%) heifers of the treatment group exhibited second natural oestrus with cycle length of 28.75±3.03 days, duration of oestrus being 29.50±3.30 hr and ovulatory percentage of 87.50. The animals that exhibited second natural oestrus were mated and 5 (62.5%) animals conceived; while two heifers of the treated group became anoestrous and remaining 3 heifers resumed cyclicity.

INTRODUCTION

The age at puberty is an important factor influencing the lifetime production of the cow. One of the greatest demerits of indigenous cattle of Assam is its higher age (33.60±2.81 months) at puberty in comparison to that of well-defined breeds of exotic (8 to 18 months) and Indian (24 to 30 months) origin. Age at puberty can be altered by genetical or nutritional means. Puberty could also be successfully induced by hormonal treatment. Tibary et al. (1992) reported that the oestrus was comparatively higher (75%) in heifers treated with norgestomet plus PMSG than with norgestomet treatment alone (60%).

MATERIAL AND METHODS

Twenty prepubertal indigenous heifers (Bos indicus) of Assam aged 20 to 24 months and weighing 70 to 90 kg that had no evidence of previous oestrus and did not have palpable corpora lutea were included for the present experiment. Clinico - gynaecological examination was carried out in all heifers as per the procedure of Zemjanis (1970) before and after hormonal treatment.

The heifers were divided equally at random into two groups viz., treatment and control groups. Each animal of the treatment group received “Crestar” ear implant containing 3 mg norgestomet (17α-acetoxy-11β-methyl-19-norpreg-4-ene-3,20-dione) in the outer surface of the ear. At the time of implantation a 2 ml injection containing 3 mg norgestomet and 5 mg estradiol valerate dissolved in sesame oil was given intramuscularly. Each control animal was administered with 2ml sterile normal saline solution intramuscularly. The implant was removed on day 9 of treatment. On the day of implant removal, “Folligon” (pregnant mare serum gonadotropin) @ 300IU was administered intramuscularly to each heifer of the treatment group while each control animal received 2 ml sterile normal saline solution.

The animals of both treatment and control groups were observed for occurrence of oestrus following implant removal. Oestrus detection was carried out by a vasectomized bull at every 6 hr interval for first 24 hr and at every 2 hr interval thereafter following implant.
removal. The time at which the female allowed the male to mount over her was considered as onset of oestrus and the time when the female refused the male to mount over her was considered as cessation of oestrus. The time of onset of oestrus, the interval from implant removal to onset of oestrus and duration of oestrus were recorded. The day of onset of oestrus was considered as day “0” of the oestrous cycle. Heifers were not allowed to mate at induced oestrus or at first natural oestrus immediately after induced oestrus. However, at second natural oestrus they were allowed to mate naturally by a proven sexually healthy indigenous bull with good libido and vigour. The ovulation was detected in the heifers by rectal palpation of corpus luteum on the ovarian surface either on day 9 or day 10 post onset of oestrus. Nonreturn of oestrus after day 21 of the cycle was considered to be indicative of pregnancy which was confirmed by per rectal examination on day 60 following mating. If the animals conceived they were allowed to continue their pregnancy till term. The animals that did not conceive were followed for their continuance of cyclicity. The data obtained from the present study were subjected to statistical analysis as per the method of Snedecor and Cochran (1967).

RESULTS AND DISCUSSION

In the present study all the heifers (100%) of the treatment group exhibited oestrus following removal of implant. Rao et al. (1986) also reported 100% oestrus response in prepubertal heifers following hormonal treatment. The cent percent oestrus response in the present study might be due to incorporation of appropriate doses of PMSG along with norgestomet treatment that promoted follicular development. No heifer of the control group exhibited oestrus during the study period. The mean interval between implant removal and onset of oestrus in heifers of the treatment group (Table 1) was found to be shorter in comparison with earlier reports in different breeds of heifer (Rao et al., 1986; Bernardo et al., 1996; and Saraswat et al., 1997). This might be due to smaller body size and lesser body weight of indigenous heifers at the time of treatment as compared to larger body size and heavier body weight of various breeds of Indian and exotic origin.

The mean duration of induced oestrus was 67.50±1.44 hr, which was found to be much longer than that reported (Sarmah et al., 2001) in indigenous heifers of Assam. The longer duration of induced oestrus could be attributed to different exogenous hormones used. Pregnant mare serum gonadotropin favored continuous recruitment of follicles over a prolonged period owing to its long half life, which resulted in sustained endogenous release of oestrogen and the dosage of oestradiol that was found to have a linear relationship with the duration of oestrus (Hafez 1987). The longer duration of oestrus might also be ascribed to lesser body weight of the indigenous heifers of Assam as compared to that in other Indian and exotic breeds, since there was a negative correlation between the body weight and oestrous duration (Prasad and Bhattacharya 1979). Out of 10 heifers induced to oestrus in treatment group 7 (70%) heifers ovulated. The present observations are in agreement with the ovulatory response in heifers after hormonal induction of puberty reported by Holtz et al. (1997) and Rao et al. (1986). All heifers that were induced to puberty exhibited first natural oestrus with a mean cycle length of 22.00±0.86 days. The period required to exhibit first natural oestrus following induction of oestrus was found to be much shorter when compared to that reported by Rao et al (1986). The mean duration of first natural oestrus was recorded to be 23.60±3.84 hr. At first natural oestrus 5 out of 10 (50%) heifers ovulated which was lower as compared to that obtained at induced oestrus. This might be due to
Table 1. Oestrus response and duration of oestrus m heifers following hormonal induction of puberty

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Treatment group (n=10)</th>
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<tbody>
<tr>
<td>Mean±SE</td>
<td>Range</td>
</tr>
<tr>
<td>Interval from implant removal of oestrus (hr)</td>
<td>29.10±0.90 26-32</td>
</tr>
<tr>
<td>Duration of induced oestrus (hr)</td>
<td>67.50±1.44 61-75</td>
</tr>
<tr>
<td>Cycle length of 1st natural oestrus (days)</td>
<td>22.00±0.86 20-28</td>
</tr>
<tr>
<td>Duration of 1st natural Oestrus (hr)</td>
<td>23.60±3.84 10-42</td>
</tr>
<tr>
<td>Cycle length of 2nd natural Oestrus (days)</td>
<td>25.75±3.03 19-47</td>
</tr>
<tr>
<td>Duration of 2nd natural Oestrus (hr)</td>
<td>29.50±3.30 18-48</td>
</tr>
</tbody>
</table>

extensive luteinization of the granulosa and theca cells in the follicles of the ovary that also might explain lower proportion of ovulation at first natural oestrus (Mickelsen et al., 1978).

In the present study 8 out of 10 (80%) treated heifers exhibited second natural oestrus between 19 and 47 days of first natural oestrus. Rao et al. (1986) and Saraswat et al. (1997) also reported continued cyclic activity in prepubertal heifers following progesterone treatment. Failure to resume cyclicity in 20% heifers of the treatment group might be due to premature luteinization of unovulated follicle(s) of earlier cycle resulting in imbalance of oestradiol and progesterone levels leading to failure of onset of oestrus. Gonzalez-Padilla et al. (1975) also observed that following induction of oestrus in heifers with norgestomet, 9% of the animals became anoestrous subsequently. The mean duration of second natural oestrus was 29.50±3.30 hr and the ovulatory response was found to be 87.5% which was higher in comparison to earlier cycles. This could be due to reduction in the incidence of unovulation with the increase in occurrence of oestrus (Morrow et al., 1976).

The animals that exhibited second natural oestrus were mated and 5 (62.5%) heifers conceived; while 2 heifers of the treatment group became anoestrous and remaining 3 heifers resumed cyclicity. From the present study it may be concluded that norgestomet treatment could induced oestrus in prepubertal indigenous heifers of Assam without any noticeable adverse effect on subsequent reproductive performances.

REFERENCES


