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Brief Communication

Effects on Testosterone and LH Concentrations of Induced Testicular Degeneration in Bulls

Various environmental factors are known to influence gonadal function. Prolonged stress in man was found to have a suppressive effect on plasma testosterone concentrations (*Aakvaag et al.* 1978). Experimentally induced cryptorchidism in rats caused a considerable reduction in testosterone levels in the abdominal testicle (*Berg & Damber* 1978). Heat stress has also an effect on cortisol levels. *Aakvaag et al.* (1978) and *Larsson et al.* (1983) showed that prolonged stress lead to increased cortisol levels and at the same time to decreased testosterone levels. In boars, treated with ACTH for 5 days, reduced testosterone concentrations were observed (*Liptrap & Raeside* 1975).

Since hormonal changes have been found to occur after exposure of animals to heat stress, it is important to study the endocrine effects of local heating, thus avoiding exposure to any external stress of the animal. To our knowledge, no study has been performed on the effect of elevated scrotal temperature, after scrotal insulation in bulls, on hormone secretion.

The aim of this study was to describe the temporal changes in peripheral plasma concentrations of testosterone and LH during and after induced testicular degeneration (i.e. scrotal insulation) in bulls.

Two bulls, 1 Swedish Red and White (A), and 1 Swedish Friesian (B) 31 and 20 months old, respectively, were used in the study.

To induce testicular degeneration the scrotum was covered by an insulation device (double plastic bag with insulation). The duration of the scrotal insulation was 120 h (5 days).

To evaluate the effect of the scrotal insulation, semen was collected 3 times at weekly intervals before scrotal insulation, at the end of the insulation period, once a week during 6 weeks and then at 2 weeks intervals for 8 weeks.

Blood-samples were collected in vacutainer tubes at 4 sampling occasions, every 2 h for 22 h (12 samples): 1) before the scrotal insulation, 2) on day 4 of scrotal insulation, 3) 1 week after scrotal insulation and 4) 4 weeks after scrotal insulation.

Plasma concentration of testosterone and LH was determined by radioimmunoassay (*Oltner et al.* 1979, *Madej et al.* 1989).

The testosterone and LH values of the bulls before, during and after scrotal insulation are presented in Fig. 1 (bull A and B), as the area under the curve. The testosterone levels in bull A were higher than in bull B, during the whole experimental period. During scrotal insulation the levels of testosterone showed a decline in both bulls. A week after scrotal insulation, the testosterone levels showed an increase, compared with the levels during scrotal insulation. Four weeks after scrotal insulation, a tendency to a decline in testosterone levels, compared with the levels before and 1 week after scrotal insulation, were seen. There were no distinct changes of the LH levels. In bull A there was a decline during the scrotal insulation period, but on the other hand there were no

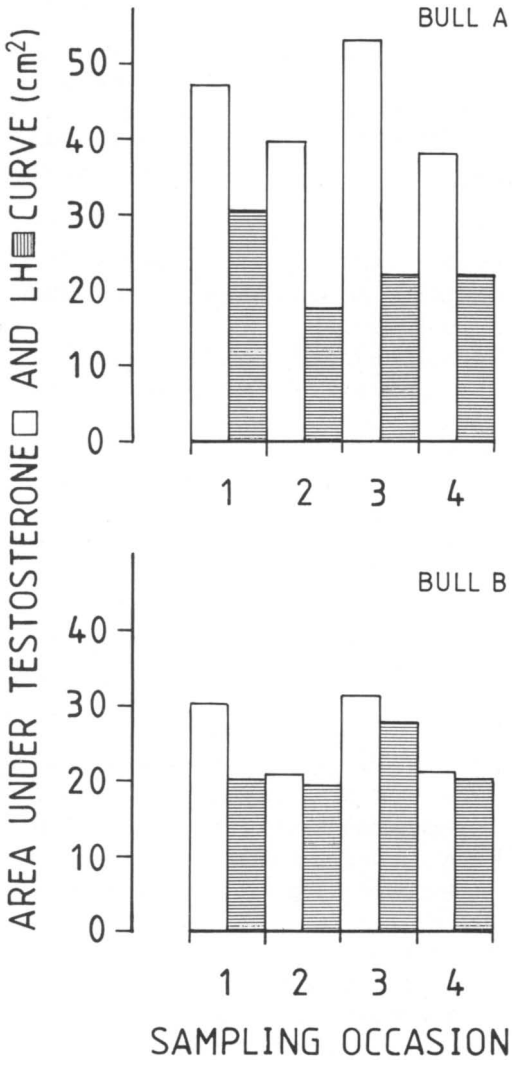

Figure 1. The figure shows the area under the testosterone □ and LH ▤ curves in bulls during 4 sampling occasions: 1. Before scrotal insulation (SI). 2. On day 4 of SI. 3. One week after SI. 4. Four weeks after SI.

changes in bull B between the pre-treatment period and the scrotal insulation period (Fig. 1).

The decrease in plasma testosterone concentrations during scrotal insulation is in agreement with a similar study done in boars (*Malmgren* 1990). The changes are also in agreement with heat stress experiments (high environmental temperature) in bulls (*Rhynes & Ewing* 1973), and in boars (*Wetteman & Desjardin* 1979, *Larsson et al.* 1983).

In the present study using only insulation of the scrotum and with the bulls maintained in a familiar environment, one can assume that the stress factor on the animals was minimal. Thus, plasma cortisol levels may remain unaffected and should not cause a reduction in the plasma testosterone levels. It seems more likely that the changes in testosterone secretion are caused by a direct effect of the higher temperature on the testis. This was previously found by *Berg & Damber* (1978) in rats, and by *Skinner & Rowson* (1968) in lamb and calves, where lowered testosterone concentrations in experimentally induced cryptorchidism indicated impaired Leydig cells function.

The LH concentrations in peripheral plasma seemed not to be influenced by scrotal insulation or the lowered levels of testosterone, This is in agreement with *Wetteman & Desjardin* (1979), who could see a decrease in testosterone concentration, but no changes in LH level after heat stress in boars. However, this was exposure of the whole body to heat and not only scrotal insulation. Maybe, the changes in testosterone concentration in this study are too small to influence the pituitary gland and cause alterations in the LH secretion. Also other hormomes of testicular origin, like e.g. inhibin, might be influenced by local or systemic heat stress. These hormones also interact with the hypothalamus-hypophysis axis and are at least partly involved in the LH response. To clarify this, more investigations need to be done.

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