

# A study of the reproductive hormones of indigenous goats in Uganda

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## Summary

Plasma progesterone and oestradiol in females and plasma testosterone in males were determined by specific radioimmunoassays (RIA) in Small East African goats. During the oestrous cycles plasma progesterone was found to vary between 2 and 18 nM/l, progesterone was high during pregnancy reaching a maximum of 21.10  $\pm$  1.46 nM/l during the last month of pregnancy, but was below 3 nM/l for several months during the postpartum period. Oestradiol-17B levels varied from 120 to 900 pM/l during a cycle and were at 554  $\pm$  424 pM/l during the second half of pregnancy. During the postpartum period oestrogens were as high as in the second half of pregnancy. Most animals became pregnant in March coinciding with lush pastures after the start of the long rains. Hormone levels postpartum suggest absence of ovulation and corpora lutea formation for several months, most probably due to LH deficiency, resulting in a longer kidding interval. Testosterone levels in male goats varied between 0.5 - 12 nM/l indicative of episodic release of LH unrelated to climatic conditions.

## Introduction

Sheep and goats are seasonal breeders in temperate climates, with the breeding season becoming longer as the equator is approached (Hafez, 1952). Tropical breeds of goats are thought to be aseasonally polyoestrus and thus can breed the year round (Mason & Maule, 1960; de Hass & Horst, 1979).

In seasonal breeders there are a number of factors which either stimulate or suppress the breeding activity. In sheep a high plane of nutrition such as caused by "flushing" is known to

influence the rate of ovulation and increases the numbers of twins and triplets. The nutritional value of tropical pastures fluctuates widely between the dry and the rainy seasons. It was therefore considered necessary to measure reproductive hormones in goats at different times of the year to determine seasonal effects. This information is required before managerial decisions or artificial manipulations of the reproductive process can be undertaken in order to increase reproductive and productive efficiencies.

## Material and methods

Mature does and bucks of the Small East African (SEA) goat were bought in 1981 and kept at Makerere University campus. Management of the animals and regular detection of oestrus in the flock have been reported elsewhere (Katongole, 1983). All animals were bled regularly, once a week for young animals and twice a week for adult animals for a period of 16 months. Blood plasma was kept at  $-20^{\circ}\text{C}$  and transferred in packed ice to Nairobi for assay.

Plasma progesterone, oestradiol and testosterone were assayed in accordance with the WHO protocol (WHO RIA Methods Manual). In each case 200 to 500  $\mu\text{l}$  of plasma was mixed with 1000 c.p.m. tritiated hormone to estimate procedural loss. The sample was then extracted with ten volumes of diethylether and after freezing the aqueous phase the extracts were poured off into glass tubes. The ether extracts were dried under nitrogen and reconstituted in 2 ml of PBS-Gel. Two aliquots of 500  $\mu\text{l}$  were taken for specific radioimmunoassay (RIA) and one aliquot of 500  $\mu\text{l}$  for recovery estimation. To each sample or standard tube was added 10 000 c.p.m. in 100  $\mu\text{l}$  of PBS-Gel of the appropriate tracer hormone and 100  $\mu\text{l}$  of the specific antibody dilution. The mixture was incubated at  $4^{\circ}\text{C}$  for 18-24 hours before separating bound from free hormone using dextran-coated charcoal. After adding 200  $\mu\text{l}$  of the charcoal mixture the whole was vortexed and stood at  $4^{\circ}\text{C}$  for 15-20 minutes before centrifuging at  $4^{\circ}\text{C}$  for five minutes at 500 g. The bound hormone in the supernatant was counted in 4 ml of PPO-toluene scintillation fluid. For the standard curve the logit of B/Bo was plotted against log dose from which the samples were read. The concentration of the hormone was then corrected for procedural losses and dilution and expressed as nM/l for progesterone and testosterone and as pM/l for oestradiol.

## Results

The hormone assays were pooled on a monthly basis. Figure 1 gives progesterone and oestradiol results in four adult does which were showing psychic oestrus and which subsequently became pregnant and produced normal kids.

### PROGESTERONE AND OESTRADIOL LEVELS DURING THE OESTROUS CYCLE

Animals showing oestrous periods before pregnancy had progesterone levels varying between 2.0 and 9.2 nM/l and oestradiol levels of 120 to 720 pM/l. Whereas low progesterone levels are most likely to have been around oestrus during the follicular phase, the higher levels occurred during the luteal phase.

### PROGESTERONE AND OESTRADIOL LEVELS DURING PREGNANCY

Figure 2 shows hormone levels of several animals during pregnancy and the postpartum period at about the time of parturition. Reference should also be made to Figure 1 for the individual animals.

During the first month of pregnancy progesterone was found to be similar to the maximal levels of cycling animals at  $9.3 \pm 1.51$  nM/l ( $n = 6$ ) but had risen to  $17.1 \pm 1.98$  nM/l by the second month of pregnancy and maximal levels of  $21.1 \pm 1.46$  nM/l were present in the last month of pregnancy. In some animals progesterone levels as high as 27.3 nM/l were recorded. Oestradiol levels rose from  $205.8 \pm 30.1$  pM/l during the first month of gestation to  $554 \pm 424$  pM/l by the third month of pregnancy and remained at that level until parturition. The highest levels of oestrogens of over 1000 pM/l were recorded in some of the animals during the last month of pregnancy.