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THE EFFECTS OF SEASON ON THE CIRCULATING TESTOSTERONE LEVEL IN THE PUBERTAL WEST AFRICAN DWARF BUCK IN ITS NATIVE ENVIRONMENT

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Target Audience; Animal scientists, goat breeders and veterinarians

ABSTRACT

Blood samples were obtained from the jugular veins of a total of 18 pubertal West African Dwarf bucks distributed in four seasons of the year. The sera were separated and assayed for testosterone by the radioimmunoassay technique. Serum testosterone levels were found to be stable throughout the year in the pubertal buck. However, a comparison of the testosterone levels in the pubertal buck with those of adult bucks raised under similar conditions of housing and management in the respective seasons of the year revealed significantly higher ($p<0.001$) values in the pubertal than in the adult buck in all the seasons of the year. While the stability of testosterone levels in the pubertal buck in all seasons of the year would imply a stability in all testosterone dependent physiological processes in the buck under good management and as such encourage the early selection of sires and an all year round breeding programme; the superiority of the pubertal buck over the adult in this regard confirms the probability of a higher receptor capacity for gonadotropins from the adenohypohysis reported to accompany puberty in other species.

Key words: Season, testosterone, WAD pubertal buck.

DESCRIPTION OF PROBLEM

The production of androgens by the interstitial cells of Leydig (1) under the influence of secretions of the anterior pituitary, has for long been established and documented (2). Testosterone once produced is then transported in the blood, attached to carrier proteins by a weak and reversible binding (3) to target sites to perform such functions as the promotion of maturation of spermatogenic cells, the production of spermatozoa, the development of the secondary sexual characteristics and normal sexual behaviour (1,4).

Age related changes in the circulating levels of testosterone have been reported for the bull (5), boar (6,7) and ram (8, 9,10) there are scanty reports on the seasonal fluctuations of the circulating testosterone levels in the goat (10,11). The complete

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lack of information on the circulating levels of testosterone in the pubertal WAD buck as well as the possible effect of season on this important aspect of male reproduction in this age group of bucks becomes a hindrance to planned breeding programmes for goats in the humid tropics where these animal are mostly reared extensively and pubertal bucks are known to have successfully served dose as the animals roam about in groups scavenging for food. Moreover, since older bucks constitute a problem as their libido and reaction time decline with increasing age (12) an early selection of sires based on a number of factors including testosterone production (and testosterone dependent physiological processes in the body) becomes necessary. We therefore proposed this study to evaluate the effect of season on the circulating levels of testosterone in the pubertal buck in its environment.

MATERIALS AND METHODS

Animal and management

A total of 18 pubertal bucks was used for this study. All animals were weaned from does at about 40 days of age and were housed in groups in the respective seasons of the year in standard goat barns, fed a maize based concentrate ration supplemented with forage *ad libitum* with cool clean drinking water supplied always. All animals were free from clinical abnormalities.

Puberty

The preputial smear technique (13, 14) using cotton buds was used to determine the onset of puberty.

Season

The study was conducted at the University of Ibadan, Nigeria with an equatorial, humid and semi-hot climate already described and divided into four seasons of the year by Egbunike and Steinbach (15,16) viz. late dry season (January to March) early rainy season (April to June), late rainy, season (July to September) and early dry season (October to December).

Collection and handing of blood

About 4.5ml of blood were obtained from the jugular veins of the animals byvenipuncture after local disinfection with methylated spirit. Using 21 gauge, 2.54cm sterile needles and 5ml sterile syringes at 0800h on collection days. Blood samples were kept at 4 -5°C for about 24h and then centrifuged at 1,200g for 5 minutes and the sera separated and stored at 20°C until analysed.

Blood was similarly obtained from healthy adult bucks of the same breed (housed and managed under similar conditions) while in the barn pen and the sera analysed as those of the pubertal bucks. The results were then compared with those of the pubertal bucks.

Testosterone assay

The reagents, assay procedure, determination of radioactivity and the validation of testosterone radioimmunoassay have already been described (17).

Statistical analyses

Data were analysed using the students 't' test and Chi Square analyses (18).

RESULTS AND DISCUSSION

The effects of season on the testosterone levels in the pubertal WAD buck are summarized in Fig 1 while a comparison of the circulating testosterone levels in the pubertal buck with that of the adult buck of the same breed under similar conditions in the respective seasons of the year is shown in Table 1. Testosterone levels were stable in the pubertal buck all through the year, and were also highly significantly higher ($P<0.001$) than values in the adult WAD buck in the respective seasons.

Fig 1.

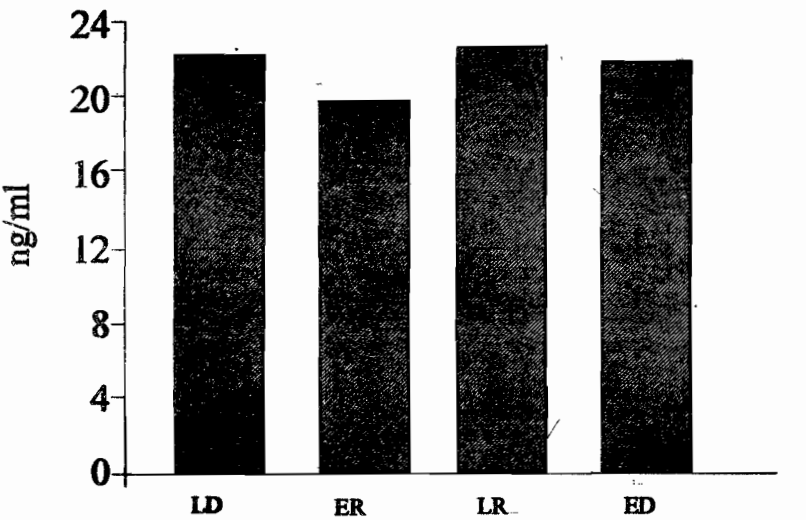

Fig. 1. **The effect of season on the circulating testosterone levels in the pubertal WAD buck.**
Seasons: Late dry (LD), Early rainy (ER), Late rainy (LR) and Early dry (ED).

Table 1. Seasonal variations in the circulating testosterone levels (ng./ml) in the pubertal and adult WAD buck (means ± s.e.m.).

	Late dry season	Early rainy season	Late rainy season	Early dry season	Mean
Pubertal buck	21.97[a] ± 1.19	19.25[a] ± 1.32	22.34[a] ± 1.74	21.67[a] ± 2.77	21.30 ± 0.60
Adult buck**	*5.15[a] ± 0.64	*6.95[a] ± 1.07	*3.31[b] ± 0.42	*40.80[a] ± 0.41	5.05 ± 0.67

ab: Values bearing different superscripts along the same row are significantly different($P<0.05$)
*: Values are significantly difficultly affected by age of animal.
** From Egbunike *et al* 1999.(23).

Even though the remarkably high reproductive potential of the WAD goat was found to follow the change of dry and rainy seasons, influenced by temperature, humidity and malnutrition status of the animal (19,20) the WAD buck has not been found to be a seasonal breeder. The general stability in the circulating testosterone levels in the pubertal buck throughout the year in the present study suggests that all testosterone dependent physiological processes in the body would likewise be stable through the year.

The superiority of the pubertal buck over the adult buck in the circulating levels of testosterone in all seasons of the year agrees with the reports of Pirke, Vogl and Geiss (21) in the rate, Gray *et al* (6) and Allrich *et al* (7) in the boar and Lee *et al* (9) and Williams *et al* (8) in the ram. This however does not imply a higher population of Leydig cells in the pubertal animal than in the adult (21, 22) but probably a higher receptor capacity for gonadotropins from the anterior pituitary gland that normally accompanies puberty (24).

CONCLUSIONS AND APPLICATIONS

These results demonstrate that all testosterone dependent physiological processes like spermatogenesis, sertoli cell secretion and normal sexual behaviour in the pubertal WAD buck are stable all year round. The early selection of sires as well as normal breeding could therefore be carried out all year round.

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