

AGE AND SEASONAL CHANGES IN THE MORPHOMETRIC DEVELOPMENT OF ACCESSORY GLANDS OF THE WEST AFRICAN DWARF GOAT.

E. A. AGIANG and G. N. EGBUNIKE

(Received 13 July 2001; Revision accepted 11 December 2002).

ABSTRACT

The effects of age and season of birth on the morphometric characteristics of the Vesicular, Cowper's and Ampulla glands were studied in 32 indigenous West African Dwarf (WAD) goats aged 1 – 12 months and 12 adults aged >12 months, in Ibadan. While the vesicular and Cowper's glands weights were highly significantly ($p < 0.001$) affected by age but not season of birth, the ampullae were stable with age and season of birth. Each of the glands accounted for less than 1% of the weight and tended to increase with age except the vesicular gland in the adults. Results suggest a closer relation in growth with age than season of birth.

This supports the non-seasonality in breeding behaviour of tropical livestock.

Key Words : Age, season, growth, accessory glands.

INTRODUCTION

Studies on the West African Dwarf goat have often centred on effect of nutrition on live-weight (gross morphology) changes (Asuquo, 1996; Umoren and Orok, 1994; Ifut 1991, Onwuka et al, 1985), pubertal attainment (Agiang and Egbunike, 1990) and testicular histomorphometry (Agiang and Egbunike 1988).

It is, however, known that the totality (absolute weight) of an individual animal is a composite of all the various parts/organs that make up the whole.

Reproductive efficiency and increased meat production can only be achieved by having a clear picture of the histological and physiological characteristics that could be used as indices for such goals (Basu et al, 1961).

The contributions of the accessory sex glands (Vesicular, Cowper's and Ampulla) in particular to the reproductive processes is in no doubt. All accessory sex glands show changes related to the development and regression of the testis (Lincoln, 1971).

Work on morphometric changes of internal organs is often scanty, incomplete, inaccurate or non-available at all because the techniques involved have often required the death of the animal, serious injury or severe pain. Knowledge of various measurements of the reproductive tract, however, has led to early pregnancy detection in female animals, for example.

In addition, morphometric studies of the glands associated with reproduction are important and essential in toxicological evaluation as well as the investigation of the functional state of the glands. For example, Orchitis or epididymitis are dysfunctions which affect the accessory glands which in turn affect semen quality.

In the tropics in general, the dry period and rainfall have marked effects on the temperature and humidity that affect animal productivity (Loosli and Blake, 1973)

This study therefore attempts to evaluate the effect of age and season of birth on the morphometric characteristics of some accessory glands involved in the reproductive processes. This is in view of the paucity of this information in

animals in general, but in the West African Dwarf goat in particular.

MATERIALS AND METHOD.

Accessory glands (Vesicular, Cowper's and Ampulla) were obtained from 32 West African Dwarf goats ranging in age from 1 – 12 months as well as 12 adults above 12 months in age.

The animals were grouped into 5 age groups viz: I(1-3 months), II(4-6 months), III(7-9 months), IV(10-12 months) and V(>12 months). All animals were apparently free from any clinical abnormality and subjected to the same prevalent ambient temperatures (Egbunike and Steinbach, 1972, 1979).

As soon as the animals were weighed and slaughtered, the glands were removed as quickly as possible and transported immediately to the laboratory where they were then dissected, freed of all extraneous tissues and weighed using mettler P M 2000 top-loading weighing balance.

The randomized complete block design was used and data were tested for homogeneity by the ordinary "F" test from analysis of variance (ANOVA) for the establishment of age effects on the glands. Similarly, data for the 32 animals were re-grouped according to their season of birth. These seasons were Late Dry Season (LD; January – March), Early Rainy Season (ER; April

– June), Late Rainy Season (LR; July – September) and Early Dry Season (ED; October – December). They were equally tested by the ordinary "F" test. All results indicating significant differences were further subjected to Duncan's Multiple Range Test (DMRT) (Steel and Torrie, 1980) to find out which of the mean values were significantly different from each other.

RESULTS

Tables 1 and 2 summarise the results of effect of age and season of birth on the absolute weights of some accessory glands of the West African Dwarf buck.

Statistical analysis revealed that vesicular and cowper's glands were significantly affected ($P < 0.001$) by age (Table 1), but not season of birth (Table 2). The ampullae were stable with age and season of birth. Paired mean weights (g) for vesicular, ampulla and cowper's glands ranged from 0.97 ± 0.14 – 5.16 ± 0.90 , 0.63 ± 0.15 – 5.21 ± 0.89 and 0.42 ± 0.1 – 2.41 ± 0.24 , respectively for periods ranging from 1 month to 12 months (Table 1).

The mean weights (g) for the three accessory glands for the 4 seasons ranged from 1.67 ± 0.41 – 2.37 ± 0.50 , 3.41 ± 0.75 – 4.73 ± 0.99 and 1.24 ± 0.24 – 1.43 ± 0.41 , respectively (Table 2).

Table 1

Age related changes on the absolute weight (g) of some accessory glands of the male West African Dwarf goat (Means \pm SEM)

Parameters	AGE		GROUPS						
	I		II		III		IV		V
	1-3Months	%	4-6 Months	%	7-9Months	%	10-12Months	%	>12 months
Paired Vesicular weight	0.97 ± 0.14^a	0.02	2.13 ± 0.21^{ab}	0.02	3.34 ± 0.05^{ab}	0.03	7.58 ± 0.03^c	0.05	5.16 ± 0.90^{bc}
Paired Ampulla weight	0.63 ± 0.15	0.01	0.43 ± 0.11	0.004	0.87 ± 0.12	0.007	1.84 ± 0.15	0.01	5.16 ± 0.89^c
Paired Cowper's weight	0.42 ± 0.1^a	0.009	1.0 ± 0.22^{ab}	0.01	1.21 ± 0.26^{ab}	0.01	2.17 ± 0.29^{bc}	0.01	2.41 ± 0.24^c

a, b, c means (\pm SEM) along rows bearing different superscripts are significantly ($p < 0.001$) different.

Absence of asterisk indicates non-significant at $p = 0.05$.

% Organ weight relative to live-weight.

Table 2: Effect of season of birth on the absolute weight (g) of some accessory glands of the male West African Dwarf goat (Means \pm SEM).

Parameters	Late dry Season (Jan. - March)		Early Rainy Season (April - June)		Late Rainy Season (July - Sept.)		Early dry Season (Oct. - Dec.)	
	(g)	%	(g)	%	(g)	%	(g)	%
Paired Vesicular weight	1.67 \pm 0.41	0.02	0.77 \pm 0.23	0.01	2.26 \pm 0.57	0.02	2.37 \pm 0.50	0.02
Paired Ampulla weight	3.47 \pm 0.75	0.03	1.65 \pm 0.35	0.03	4.59 \pm 1.10	0.04	4.73 \pm 0.99	0.04
Paired Cowper's weight	1.06 \pm 0.24	0.01	0.85 \pm 0.10	0.02	1.89 \pm 0.37	0.02	1.43 \pm 0.41	0.01

Absence of asterisk indicates non-significance at $p = 0.05$.

% Organ weight relative to live-weight.

The mean weights (g) for the three accessory glands for the 4 seasons ranged from $1.67 \pm 0.41 - 2.37 \pm 0.50$, $3.41 \pm 0.75 - 4.73 \pm 0.99$ and $1.08 \pm 0.24 - 1.43 \pm 0.41$, respectively (Table 2).

Each of the glands studied accounted for less than 1% of the liveweight and tended to increase with age except the vesicular weight of

the adults which declined towards adulthood (Fig. 1). The three accessory glands in both the kid and adult goats were significantly ($p < 0.01$) correlated with each other (Table 3 and 4).

DISCUSSION

That accessory gland growth is concomitant and simultaneous with both chronological age and

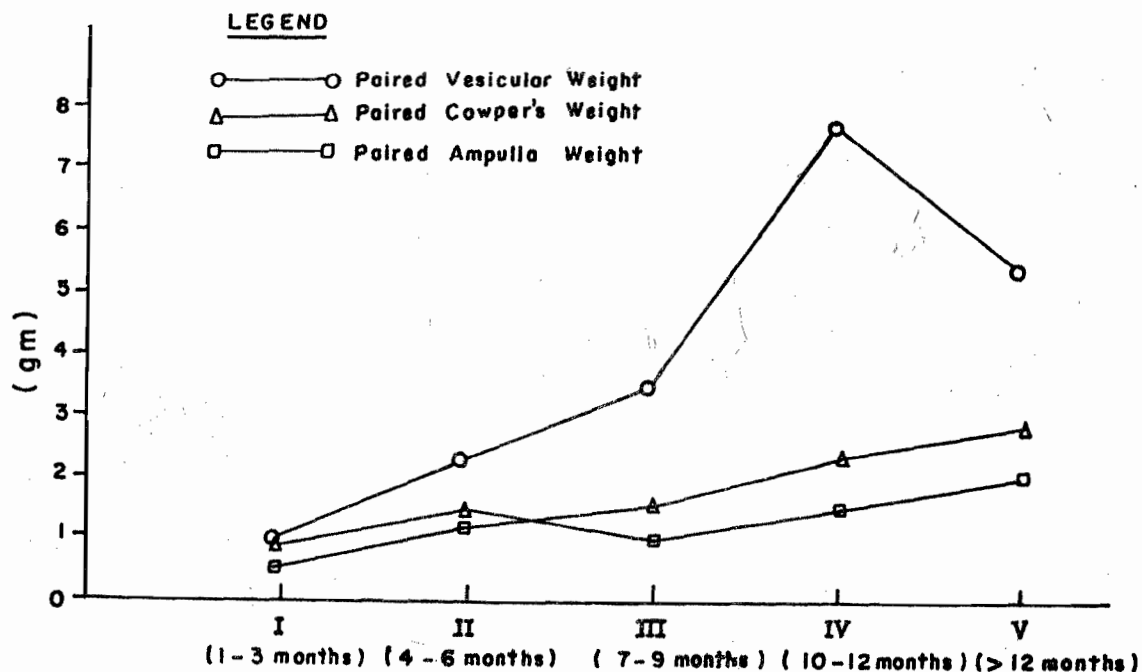


FIG. 1: AGE CHANGES IN THE MORPHOMETRY OF SOME ACCESSORY GLANDS OF THE MALE WEST AFRICAN DWARF GOAT.

Table 3: Correlation coefficients (r) of morphometric characteristics of the male West African Dwarf goat from birth to twelve months.

		5	4	3	2	1
1	Age	0.62 ^c	0.78 ^a	0.90 ^a	0.92 ^a	-
2	Live weight	0.61 ^a	0.72 ^a	0.87 ^a	-	
3	Paired vesicular Weight	0.52 ^b	0.82 ^a	-		
4	Paired Ampulla Weight	0.57 ^a	-			
5	Paired Cowper's Weight	-				

All correlations are not significant except

a = significant at $p < 0.001$

b = significant at $p < 0.01$

TABLE 4: Correlation coefficients (r) of morphometric characteristics of the adult male West African Dwarf goat.

		4	3	2	1
1	Live weight	0.60 ^c	0.77 ^b	0.72	-
2	Paired vesicular Weight	0.82 ^a	0.57	-	
3	Paired Ampulla Weight	0.73 ^b	-		
4	Paired Cowper's Weight	-			

All correlations are not significant except

a = significant at $p < 0.001$

b = significant at $p < 0.01$

c = significant at $p < 0.05$

Absence of asterisk indicates non-significance at $p = 0.05$.

physiological development is observed by the highly significant ($P < 0.001$), correlation between the glands, age and liveweight in the growing bucks.

The significant increase in vesicular gland weight with age supports the conclusion of Lincoln (1971) who reported a linear relationship between age and vesicular gland development in the stag from 3 – 15 months. The significantly high correlation ($p < 0.001$) among the accessory glands in both the kids and adults suggest increased complementary accessory glands' secretion which could influence the weights of the glands.

The non-significant increase in weight of the ampulla with age may be inferring stability of growth of this gland, but disagrees with Macmillan and Hafs (1969) who reported a linear increase in the weight of the ampulla from birth to 12 months

in the bull. The non-significant seasonal effect on the growth of the accessory organs in general conforms with the report of Ravoult et al, (1977).

The stability in the growth of the accessory glands with seasons as opposed to the seasonality in growth of the testes, (Skinner, 1977) in antelopes could be as a result of the seasonality in the breeding patterns of animals in temperate regions showing a marked endocrine activity in the breeding season with a concomitant growth compared to the all-year round breeding behaviour of animals in the tropics. However, Agiang et al., (1984) reported suppression of caprine male endocrine functions in the hotter periods of the year inferring an upward swing in the cool season. Whether this is followed by an alternate repression or stimulation of reproductive organ growth is yet to be ascertained. Based on the results of this work, it is inferred that

irrespective of the seasonal disparity in nutrient content of pasture which goats feed, the growth of the accessory glands proceeds in close association with progressive age than with season in which the animals were kidded.

REFERENCE

- Agiang, E. A., Nduka, E. U. and Egbunike, G. N., 1984. Seasonal and diurnal variations in the Leyding Cell potential in the West African dwarf goat in its native environment. Proc. 10th Int. Congr. Anim. Reprod. And A. I. Illinois USA. Vol. 1. 128 (Abstr.)
- Agiang E. A and Egbunike, G. N., 1988. Age changes in the histomorphometry of the reproductive organs of the West African Dwarf buck. Proc. 1th Intern. Congr. Of Anim. Reprod. And A. I. Durbliin, Ireland. 3 (363): 3pp.
- Agiang E. A and Egbunike G. N., 1990. Age at puberty in the male West African Dwarf goat in a humid tropical environment by the penile smear technique. Trop. Anim. Prod. Invest: 1: 28-33.
- Asuquo, B. O., 1996. Planted Leguminous Browsers and small ruminant production. Journ. Applied Sci & Education. Vol. 4(2): 61-65.
- Basu, S; Goswani, S. K. and Roberts, S. J., 1961. Studies on the genitalia of she-goat. The Indian Verterinary Journ. Xxxviii : 302 - 304.
- Egbunike, G.N. and Steinbach, 1972. Age changes in the testicular function of boars reared in a tropical environment. Proc. 7th intern cong. Of Anim. Reprod. And A.I Munich Vol. III: 2087 - 2090.
- Egbunike, G. N. and Steinbach, 1979. Seasonal variations in the sperm production rates in humid tropical environment. Nigeria Journ. Of Agricultural Science. 1: 21-26
- Ifit, O. J., 1991. Potential of cassava peels for goat feeding in Nigeria. Beitr. Trop. Landwirtschaft. Vet. Med. 29(199): 11.3, 353 - 361.
- Lincoln, G. A., 1971. Puberty in a seasonally breeding male, the red deer stag. *Cervis Glaphus* L. Journ. Of Reproduction and Fertility. 25:41 - 54.
- Loosli, J. K. and Van Blake, H. E., 1973. The tropical environment and animal productivity. Animal Production in the Tropics: Heineman.
- Macmillan, K. L. and Hafs, H. D., 1969. Reproductive tract of Holstein Bulls from birth through puberty. Journ. Of Animal Science. 78:233-239.
- Onwuka, C. F. I.; Akinsoyinu A. O. and Mba A. U., 1985. Protein and energy requirements of West African Dwarf goats fed varying levels of browse (cassava) leaves and cassava peels. Proc. Nat. Conf. On ruminant production. Zaria Oct. 6th - 10th.
- Ravault, J. P.; M. Garnier; D. Pelletier; and Terqui, M., 1977. Effect of 2-bromo-ergocryptine (CB 154) on plasma prolactin, LH and testosterone levels, accessory reproductive glands and spermatogenesis in lands during puberty. Journ. Of Animal Science; 34(3): 4.
- Skinner, J. D., 1971. A bilaterally cryptochid springbok ram, *antidorcas marsupialis*. Journ. Of Reproduction and Fertility. 26: 479-454.
- Steel, R. G. D and Torrier, J. H., 1980. Principles and Procedures of statistics. McGraw-Hill, New York.
- Umoren, U. E. and Orok, E. J., 1994. Voluntary intake of some indigenous browse species by the West African Dwarf goats. Journ. Of Applied Chem. And Agric. Res. 1(1): 30 - 34.