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Age Related Changes in Body Weight and Gonadal Size in Jersey x Kankrej Crossbreds From Birth to Puberty

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ABSTRACT

Gonadal growth relative to age and body weight changes was studied in 40 Jersey X Kankrej crossbred male calves by collecting testes at different ages starting from birth to 16 months of age. Paired testicular weight (PTW) at birth was 4.52±0.92 gm which increase to 16.77±2.19 to 38.43±9.55 gm at 5 and 8 month of age. Thereafter it grew rapidly and attained 107.67±23.90 and 442.80±41.46 gm at 12 and 16 month of age respectively. The length, width, thickness and circumference of testes showed steady growth indicating constant shape. Highly significant ($P < 0.01$) and positive correlation of age and body weight with PTW and other testicular biometrics were recorded. Equation for predicting PTW and testicular circumference from age and body weight have been developed.

——x——x——x——

Onset of puberty is largely a function of growth and establishment of normal endocrine function. In pubertal development gonadal growth follows endocrine changes and growth of gonads is largely a function of body weight changes.

The gonadal growth has been measured in terms of increase in weight and through changes in various testicular biometrics such as length, width, thickness and circumference including scrotal circumference (Abdel Raouf, 1960; Raja and Rao, 1983; Singh and Pangawkar, 1989; Rao *et al.,* 1992).

Keeping in view the significance of gonadal growth in relation to age and body weight and paucity of information on Jersey x Kankrej crossbreds, the present investigation was planned. Attempts have also been made to generate prediction equations to estimate PTW and testicular biometrics from age and body weight.

MATERIALS AND METHODS

Testes along with edididymus were collected at birth 2, 4, 5, 6, 7, 8, 10, 12 and 16 months of age from a group of 40 Jersey x Kankrej crossbred male calves with 50 percent Jersey inheritance. All calves were maintained under standard feeding and management condition at Livestock Research Station, Anand. The testes were collected from atleast two animals in each group by opening the scrotum surgically.

Immediately after collection each testis was cleaned and weighed on balance to a accuracy of 10 mg. The length, width, thickness and circumference of each testis at the point of its maximum value were measured using divider, centrimetric scale and a wire thread as per the procedure described by Raja and Rao (1983) the body weight of the calves were recorded on the day of collection. The data derived was analysed using standard statistical procedure (Snedecor and Cochran, 1976).

The correlation of age and body weight with different testicular biometrics were

worked out and prediction equations of PTW and testicular circumference (TC) on age and body weight were established on computer using stepwise and multiple regression analysis.

RESULTS AND DISCUSSION

The mean weight and measurements of the testis collected at different ages from a group of Jersey x Kankrej crossbred male calves are presented in Table-1.

The results revealed that testicular growth was progressive from birth to 16 months of age. The rate of growth was slow in the begining, became rapid between 5 to 8 months more rapid after 12 months of age on approaching, puberty and most rapid after 12 months of age as evident from the ratio of PTW in gram to body weight in kg (Table 1). At birth PTW of the crossbred male calves was 4.52±0.92 g, which grew slowly to 16.77±2.19 and 38.43±9.58 g at 5 and 8 months of age. Thereafter, it grew more rapidly and attained average PTW of 72.74±17.63 and 107.67±23.90 g at 10 and 12 months of age respectively. Similar trend of growth of bovine testes was reported in different exotic and crossbred cattle (Abdel Raouf, 1960; McMillan and Hafs, 1969; Raja and Rao, 1983).

The different testicular measurements viz. length, width, thickness and circumference of the testes showed consistant rise indicating a constant shape of the testes during prepubertal period. The growth was slow at the begining, became rapid after 8 months and more rapid after 12 months of age. Results indicated that testes had more width than thickness at all ages of growth which is in accordance to the findings of Singh and Pangawkar (1989), Rao and Rao (1990). The average testicular circumference (TC) recorded at birth, 2, 4, 6, 8, 10, 12 and 16 months of age was 3.37, 4.33, 4.86, 5.75, 7.48, 9.23, 11.05 and 17.42 cm. The trend of changes in PTW and T.C. with respect to age followed a similar pattern of age related changes in body weight of the animals indicating a positive association among them. It can further be noted that there was a considerable increase in PTW and TC from 10 months of age onwards. The PTW increased from 72.74±17.63 at 10 months of age to 442.80±41.46 g at 16 months which could be attributed to hormonal changes associated with onset of puberty. The weight and measurements of testes observes in the present study were well comparable to those reported earlier (Abdel Raouf, 1960; Raja and Rao, 1983).

Correlation coefficient of PTW and testicular circumference with respect to age and body weight were highly significant and were of the magnitude of 0.85 to 0.97. Highly significant and positive correlation of age and body weight with PTV was also reported in different beef, dairy and crossbred bulls (Coulter and Foote, 1976; Coulter and Killer, 1982; Tegene *et al.*, 1991; Rao *et al.*, (1992).

As the correlations were found positive and highly significant, attempts were made to formulate linear prediction equations of PTW and TC from age and body weight and the results are presented in Table-2. It is evident from Table that the best fitting linear regression equations describing relationship between PTW in grams and TC in cm on age of the crossbred males were:

(i) PTW (g) = 108.6146 + 6.2007 X_1 (R^2 = 69.69%)

(ii) TC (cm) = 1.1611 + 0.2094 X_1 (R^2 = 88.90%)

Where X_1 = Age in weeks.

The corresponding best fitting linear regression equations describing the regression of PTW and TC on body weight of the animals are:

(i) PTW (g) = 75.0177 + 1.5358 X_2 (R^2 = 90.67%)

(ii) TC (cm) = 2.8185 + 0.0470 X_2 (R^2 = 95.15%)

Where,

X_2 = Body weight in kg

R^2 values of the equation reveal that incorporation of age in the regression equation has little effect on accuracy of prediction, and PTW and TC could be predicted with reasonable accuracy from body weight alone. The best fitting linear regression equations describing the relationship of PTW and TC on age and body weight of the crossbred bulls would be :

(i) PTW (g) = -49.2738 - 2.4595 X_1 + 2.0305 X_2 (R^2 = 92.23%)

(ii) TC (cm) = 2.1733 + 0.0616 X_1 + 0.0346 X_2 (R^2 = 96.24%)

Where, X_1 = Age in weeks and

X_2 = Body weight in kg.

Table 1. Mean testes weight and measurements at different age and body weight of Jersey x Kankrej crossbreds.

Age (months)	No.of obs. (n)	Body weight (kg)	Paired Testicular weight (g)	Testicular measurements				PTW Body wt. Ratio
				Length (cm)	Width (cm)	Thickness (cm)	Circum. (cm)	
Birth	3	16.67 ±0.67	4.52 ±0.92	2.25 ±0.16	1.09 ±0.07	0.95 ±0.07	3.37 ±0.37	0.27±0.04
2	2	34.00 ±3.99	7.76 ±1.82	3.05 ±0.35	1.50 ±0.05	1.33 ±0.03	4.33 ±0.22	0.23±0.02
4	9	52.44 ±3.68	11.60 ±1.31	3.36 ±0.13	1.60 ±0.06	1.35 ±0.06	4.86 ±0.23	0.22±0.02
5	4	55.50 ±1.40	16.77 ±2.19	3.66 ±0.08	1.78 ±0.12	1.60 ±0.11	5.44 ±0.39	0.30±0.04
6	3	54.33 ±1.20	17.06 ±2.97	3.68 ±0.22	1.96 ±0.16	1.78 ±0.22	5.75 ±0.39	0.31±0.05
7	3	59.33 ±5.56	19.85 ±2.59	4.32 ±0.16	1.93 ±0.12	1.73 ±0.12	5.77 ±0.32	0.34±0.05
8	3	116.83 ±16.85	38.43 ±9.58	4.64 ±0.27	2.42 ±0.25	2.27 ±0.25	7.48 ±0.91	0.32±0.05
10	5	125.00 ±10.59	72.74 ±17.63	6.41 ±0.50	3.06 ±0.19	2.27 ±0.18	9.23 ±0.65	0.56±0.09
12	3	144.17 ±1.64	107.67 ±23.90	7.28 ±0.54	3.57 ±0.29	3.18 ±0.28	11.05 ±0.78	0.75±0.16
16	5	318.30 ±8.85	442.80 ±41.46	11.78 ±0.41	5.75 ±0.18	5.51 ±0.23	17.42 ±0.69	1.39±0.13

Table 2. Regression of testicular biometries on age and body weight in Jersey x Kankrej crossbred males.

Independent variables	Testicular biometries	Intercept (a)	Regression coefficients (b_1)	Regression coefficients (b_2)	R^2 (%)
Age (weeks)	PTW	-108.6146	6.2007** ±0.6547	—	69.69
	TC	1.1611	0.2094** ±0.0118	—	88.90
Body Weight (kg)	PTW	-75.0177	—	1.5358** ±0.0789	90.67
	TC	2.8185	—	0.0470** ±0.0017	95.15
Age and Body wt. together	PTW	-49.2738	-2.4595** ±0.8908	2.0305** ±0.1934	92.23
	TC	2.1733	0.0616** ±0.0185	0.0346** ±±0.0040	96.24

** $P < 0.01$, R^2 = Coefficeint of determination.

REFERENCES

Abdel Raouf, M. (1960. The postnatal development of the reproductive organs in bulls with special reference topuberty. *Acta Endocrinologia Supplementum* 49 (1L), Almquist and Wiksells Boktryckeri, Uppasala.

Coulter. G.H. and Foote, R.H. (1976). Relationship of testicular weight to age and scrotal circumference of Holstein bulls. J. Dairy Sci. *59:* 730-732.

Coulter, G.H. and Keller, D.G. (1982). SCrotal circumference of young beef bulls, Relationship to paried testes weight, effect of breed and predictability. Can. J. Anim. Sci. *62:* 133-139.

McMillan, K.L. and Hafs, H.D. (1969). Reproductive tract of Holstein bulls from birth through puberty. J. Anim. Sci.*28:* 233-239.

Raja, C.K.S.C. and Rao, A.R. (1983). Postmatal growth of testis and epididymis of Brown-Swiss crossbred bulls. Indian J. Anim. Sci. *53:* 73-76.

Rao, C.V. and Rao, A.V.N. and Venkatramaiah, P. (1992). Age and breed related changes in body weight and testis size in bulls. Indian Vet. J. *69:* 415-418.

Rao, K.B. and Rao, A.R.M. (1990). Body, scrotal, testicular measurements and semen characteristics in 50% and 75% exotic crossbred bulls. Indian Vet. J. *67:* 238-241.

Singh, D.M. and Pangawkar, G.R. (1989). Biometry of genitalia of exotic and crossbred bulls. Indian J. Anim. Reproduc. *10:* 65-67.

Snedecor, G.W. and Cochran, W.G. (1976). Statistical Methods, 6th Ed. Oxford & IBH PUblishing Co., New Delhi.

Tegene, A., Entwistle, K.W. and Mukasa, MUgerwa, E. (1991). A quantative histological study of testicular and epidermal development in Boran and Boran x Friesian bulls in Ethiopia. Theriogenology, *35:* 991-1000.