Nitrogen and Mineral Balances in Calves as Affected by Digestible Protein Levels and Urea Feeding

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The nitrogen-balance index is a measure of biological value of protein. Similarly the progress of bone development can be followed quantitatively in the living animal by calcium and phosphorus balances. In the present study effect of digestible crude protein levels and urea on the balances of nitrogen, phosphorus and calcium has been studied. The experiment was conducted on 18 Surti buffalo calves between the age group of 6-9 months and 48-69 kg body weight. Calves were divided into 3 groups of 6 each (3 castrated and 3 uncastrated). The treatments were T1-100% DCP; T2-80% DCP and T3-100% DCP as suggested by Sen and Ray (1971) but 20% DCP was replaced by urea in group-3. The energy level was kept constant. The feeding consisted of wheat straw chaffed (Thrasher), with concentrate mixture. The ingredients and their proportions used for concentrate mixture are presented in Table-1.

Concentrate mixture I was used for feeding to calves of T1 group and concentrate mixture II was used for feeding to calves of T2 and T3 groups.

TABLE 1

Ingredients and their proportions (%) in concentrate mixtures.

Ingredients	*Concentrate mixture*	
	I	II
Groundnut cake	25	30
Cotton seed cake	5	6
Guar bhardo	15	5
Maize gluten	21	26
Deoiled rice bran	19	18
Molasses	15	15
Cal. DCP*	19.6	17.6
Cal. TDN*	68.0	68.6
Vitamin A	1.5 gm	1.5 gm

*Calculated figures.

Urea was daily weighed as per requirement and fed to calves of group 3 after mixing in concentrate mixture. Concentrates and or urea were fed to meet the DCP requirement and adjusted at every week as per change in body weights. Twenty grams mineral

mixture having 22.63% calcium and 10.05% phosphorus was fed daily to all the calves. Three metabolism trials were conducted on all the calves during 6th, 21st and 36th weeks of the study period. The feces and urine were collected for 7 days and the samples were analysed by standard methods of AOAC (1970). The data were statistically analysed according to Snedecor and Cochran (1968)). The average roughage and concentrate consumed by the calves under T1, T2 and T3 were 1.72, 1.18; 1.75, 2.35 and 1.61, 1.29 kg/day respectively and the DCP and TDN available were 283, 1485; 244, 1453 and 274, 1389 g respectively. The average body weights of calves under the experiment were: T1-110, T2-107 and T3-98 kg.

The average nitrogen, phosphorus and calcium balances of castrated and uncastrated calves under different treatments are given in Table 2.

The average nitrogen balances of calves under T1, T2 and T3 were 26.49, 21.73 and 24.73 g/day/animal. When nitrogen retention figures were calculated as per cent of intake it worked out to be 41.9, 37.7 and 39.2% in T1, T2 and T3 rspectively which did not differ significantly. Nitrogen excretion through feces was more in T2 followed by T3 and T1. The urinary nitrogen excretion in urea fed group (T3) was more as compared to T1 and T2. In general the nitrogen balance was not significantly affected due to two levels of DCP or urea feeding. Higher DCP feeding is associated with higher nitrogen balance as reported by Puntambekar (1973); Talpada *et al.* (1975); Sharma *et al.* (1975), which is in agreement with present observations.

The balances of phosphorus were 5.62, 5.32 and 5.37 g/day/animal in T1, T2 and T3 respectively. It is also observed that the uncastrated calves under all the treatments had higher phosphorus balance as compared to castrated calves, however, the differences were non-significant. The higher phosphorus balance of uncastrated calves seems to be due to lower excretion of phosphorus through feces and urine.

Comparison of DCP feeding showed higher phosphorus balance in 100% of DCP fed group (T1) as compared to lower level of DCP feeding (T2). Urea incorporation (T3) compared to same level of DCP feeding (T1) resulted in slightly less phosphorus retention but was higher as compared to T2. However, these differences were non-significant.

The calcium balances were 4.89, 5.13 and 4.89 g/day/animal under T1, T2 and T3 respectively. The uncastrated calves under all the treatments had higher calcium balance as compared to castrated calves and the difference was significant. The effect of DCP levels and urea feeding had little effect on calcium balance and the differences were non-significant. Anaokar (1970); Puntambekar (1973) and Talpada *et al.* (1975) did not find significant effect of DCP feeding on phosphorus and calcium balance which is in agreement with the present observations. Singh and Talpatra (1971)

TABLE 2

Average nitrogen, phosphorus and calcium intake, voided and balances (g/day/animal).

Treatments			T_1			T_2			T_3
Particulars	*Castrated*	*Uncastrated*	*Av.*	*Castrated*	*Uncastrated*	*Av.*	*Castrated*	*Uncastrated*	*Av.*
				Nitrogen					
Intake	61.59	64.77	63.18	57.24	58.09	57.67	65.55	60.61	63.08
Voided feces	18.53	17.27	17.90	17.92	19.08	18.50	18.52	17.91	18.22
Voided urine	21.59	15.98	18.79	16.22	18.66	17.44	18.97	21.30	20.13
Total voided	40.12	33.25	36.69	34.14	37.74	35.94	37.49	39.21	38.35
Balance	+21.47	+31.52	+26.49	+23.10	+20.25	+21.73	+28.06	+21.40	+24.73
				Phosphorus					
Intake	13.88	14.45	14.17	13.00	13.04	13.02	12.97	11.93	12.45
Voided feces	7.60	7.11	7.36	6.77	6.59	6.68	6.71	5.53	6.12
Voided urine	1.23	1.15	1.19	0.93	1.10	1.02	1.00	0.91	0.96
Total voided	8.83	8.26	8.55	7.70	7.69	7.70	7.71	6.44	7.08
Balance	+5.05	+6.19	+5.62	+5.30	+5.35	+5.32	+5.26	+5.49	+5.37
				Calcium					
Intake	14.41	15.16	14.79	15.18	16.20	15.69	15.12	14.87	15.00
Voided feces	9.85	9.14	9.50	9.61	10.43	10.02	10.04	9.05	9.55
Voided urine	0.41	0.39	0.40	0.72	0.35	0.54	0.72	0.39	0.56
Total voided	10.26	9.53	9.90	10.33	10.78	10.56	10.76	9.44	10.11
Balance	+4.15	+5.63	+4.89	+4.85	+5.42	+5.13	+4.36	+5.43	+4.89

ANOVA

Sources of variation	*d.f.*	*Nitrogen*		*Phosphorus*		*Calcium*	
		F.	*C.D.*	*F.*	*C.D.*	*F.*	*C.D.*
Treat.	2	1.670	ns	0.151	ns	0.255	ns
C. Vs Unc.	1	0.008	ns	1.051	ns	10.910**	0.689
Treat.x C vs Unc.	2	5.510*	5.742	0.502	ns	0.698	ns
Error	12						
Total	17						

ns = on-significant; * = Significant at 5% level; ** = Significant at 1% level.

fed diets with 3.8 to 15.0% protein to Hariana calves of 7-9 months of age and observed that the calves fed lowest level of protein, showed practically no retention of calcium while those fed higher protein had a maximum rerention of calcium. In the present study the protein content of concentrate mixtures were around 20% and hence such observations can not be expected.

The balances of phosphorus and calcium are not affected by urea feeding is reported by Anaokar (1970) and Puntambekar (1973). High levels of urea feeding, however, results in negative phosphorus balance as reported by Mishra (1969) and Patel *et al.* (1969).

The overall results on balances of nitrogen, phosphorus and calcium indicated beneficial effect of higher DCP feeding as far as nitrogen and phosphorus retentions are concerned. Urea incorporation up to 20% DCP replacement had no adverse effect on balances of nutrients.

(*Received on 4th Sept. 1979*)

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