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Effect of degree of *Theileria annulata* infection on nutrient utilization and hematological profile in crossbred calves

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Abstract

Eighteen calves were divided into 3 groups of 6 animals each in a completely randomized design. Group I served as control whereas the animals in groups II and III were experimentally infected with 2 and 3 tick equivalent of *Theileria annulata* sporozoite. Intake, digestibility of nutrients and N-balances did not differ among the groups during the incubation period. During clinical phase feed intake and N balances were reduced in infected groups. Lower Hb content from day 7 of infection noticed in infected groups. *Theileriosis* reduced feed intake, N-balance and Hb during clinical phase. Digestibility of the nutrients was not affected.

Keywords: *Theileria annulata*, calves, sporozoite, feed intake

Introduction

Parasites and parasitism have been one of the major constraints to animal productivity throughout the world. Among the parasitic diseases bovine tropical theileriosis has the greatest economic impact on livestock production from a global perspective (Brown, 1997) [2]. Apart from calf-hood mortality and adulthood morbidity varying from 90% in exotic cattle to less than 5% in indigenous breeds, the disease causes deleterious effect on growth and fertility in adolescent stock (Tyler, 1981) [5]. Moreover, the animals recovered from a primary attack of the disease become long term carriers of the organisms. Current control strategies include using cell line vaccine and buparvaqone treatment, and often these methods have draw backs. Ideal approach to control tropical theileriosis includes a port folio of integrated strategies that are economically and environmentally sustainable. Modulating immunity of the animal to the infection by nutritional manipulation is one of the latest modus operandi in control and prevention of different infectious diseases. Clinico-nutritional studies on nutrient intake and utilization during incubation and clinical phase of theileriosis has not been reported earlier. Present pilot study, thus, examines the effect of different levels (two) of *theileria annulata* infection on feed intake, nutrient utilization, Hb content and PCV (%) of crossbred calves during the course of disease.

Materials and methods

18 crossbred male calves with an average age of 6 months (88.37 ± 3.37 kg body weight) were randomly allocated into three groups (I, II and III) of six animals each. Prior to the feeding trial all the experimental calves were treated for endo and ectoparasites with albendazole (orally) and butox liquid spray, respectively. All the animals were offered weighed quantities of concentrate mixture and wheat straw in the morning to meet the nutrient requirement for maintenance and 500g average daily gain in body weight (NRC, 1989) [3].

Animals in the groups, II and III, were inoculated with 2 and 3 tick equivalents of stabilites of *Theileria annulata* (Parbhani strain). Inoculation was done subcutaneously near the left pre-scapular lymph nodes of the calves. Two consecutive digestions cum metabolism trials were conducted after the inoculation. First metabolism trial was conducted during incubation phase and the second trial was conducted after observing the clinical symptoms. Samples of feeds and faeces collected during the metabolism trial were pooled after estimation of DM for proximate analysis as per AOAC (1995) [1].

Hematological parameters were analyzed following standard procedure described by Wintrobe (1956) [6].

The data generated during the course of study was analyzed as per standard statistical methods (Snedecor and Cochran, 1994) [4].

Results

Incubation period

During Incubation period of feeding trial intake of concentrates, wheat straw and overall dry matter (g/d) did not differ significantly among the groups (Fig 1). During the metabolism trial in incubation period values on DM intake (DMI, g/d) also did not differ significantly among the groups. Clinical phase During clinical phase of feeding trial dry matter intake (g/d), particularly the intake of wheat straw, was significantly lower in calves in low and high dose groups. DMI was 2974, 2324 and 2319 g/d and Roughage:concentrate was 0.58, 0.47 and 0.45 in control, low dose and high dose group, respectively; values being significantly higher in control than that of low and high dose groups. With the subsidence of temperature, the intake of wheat straw in both the infected groups started to increase from 3rd fortnight onwards of feeding trial. The PCV (%) of infected calves was reduced from 7d PI to 21st d PI; (Table. 2) whereas, the Hb (g/dl) content reduced from 14d PI to 21std PI; differences being nonsignificant between low and high dose groups. During the multiplication phase of infection destruction of

erythrocyte occurred which in turn reduced the PCV (%) and Hb. On going through the results, it could be concluded that *Theileriaannulata* infection though significantly reduced the PCV (%) from 7d to 21dPI, increased the rectal temperature from 10 to 21dPI, and Hb (g/dl) from 14 to 21dPI; but, did not have any adverse effect on nutrient intake and utilization during incubation period; where as during clinical phase of infection, it had adverse effect on intake of wheat straw, total DM, CP, energy and plane of nutrition of calves and N-balances as % of intake and absorbed; without any significant difference among the groups on digestibility of nutrients. It was further revealed that degree of infection did not have any significant differences in creating adverse effect on nutrient intake and utilization in growing calves.

Conclusion

Theileria annulata infection significantly reduced the PCV (%) from 7d to 21dPI, increased the rectal temperature from 10 to 21dPI, and Hb (g/dl) from 14 to 21dPI. It does not have any adverse effect on nutrient intake and utilization during incubation period; where as during clinical phase of infection, it had adverse effect on intake of wheat straw, total DM, CP, energy and plane of nutrition of calves and N-balances as % of intake and absorbed; without any significant difference among the groups on digestibility of nutrients.

Table 1: Fortnightly feed intake (g/d) in cross bred calves

Attribute	Control	Low dose	High dose	SEM
First fortnight				
Conc. intake	1244	1254	1250	6.421
Wheat straw intake	1353	1506	1463	58.59
Total DM intake	2597	2760	2714	63.32
Second fortnight				
Conc. intake	1246	1239	1256.	8.93
Wheat straw intake	1727a	1085b	1062b	120.6
Total DM intake	2974a	2324b	2319b	125.7
Roughage:Conc	0.58a	0.46b	0.45b	0.02
Third fortnight				
Conc. intake	1261	1275	1280	9.33
Wheat straw intake	2131	1642	1545	146.6
Total DM intake	3393	2917	2826	152.4
Fourth fortnight				
Conc. intake	1277	1291	1296	9.45
Wheat straw intake	2558	2297	2500	150.4
Total DM intake	3835	3588	3168	160.6
Fifth fortnight				
Conc. intake	1413	1354	1363	35.27
Wheat straw intake	2311	1999	2168	160.6
Total DM intake	3725	3354	3531	187.9
Sixth fortnight				
Conce intake	1583	1577	1471	83.13
Wheat straw intake	1976	1807	1879	139.4
Total DM intake	3560	3383	3350.	203.9
Seventh fortnight				
Conce.intake	1609	1537	1380	101.5
Wheat straw intake	2477	2450	2317	198.4
Total DM intake	4086	3987	3697	278.3
Eighth fortnight				
Conc. intake	1638	1600	1474	105.8
Wheat straw intake	2639	2499	2384	171.2
Total DM intake	4276	4099	3859	263.5
Ninenth fortnight				
Conc. intake	1854	1784	1661	131.7
Wheat straw intake	2728	2922	2761	172.9
Total DM intake	4503	4706	4423	297.6
Tenth fortnight				

Conc. intake	1863	1785	1657	132.2
Wheat straw intake	2764	2754	2668	204.2
Total DM intake	4628	4539	4325	328.2
Overall				
Conc. intake	1499	1471	1411	58.28
Wheat straw intake	2366	2214	2172	147.2
Total DM intake	3866	3686	3583	201.6

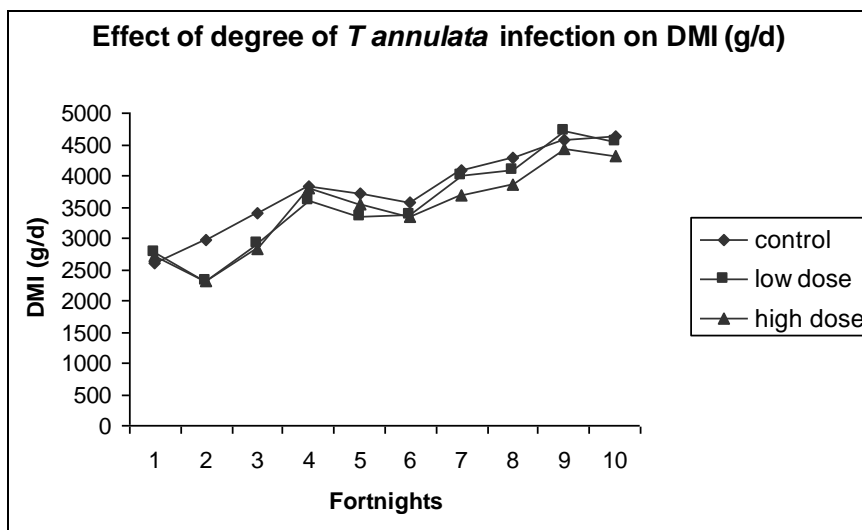


Diagram 1: Effect of degree of *T. annulata* infection on DMI (g/d)

Table 2: Haematological profile of the crossbred calves after infection

Attribute	Control	Low dose	High dose	SEM
Packed cell volume (PCV %)				
Days after infection				
0	38.08	34.83	33.33	1.28
7	38.00x	24.00y	25.50y	1.82
14	37.66x	17.00y	21.66y	2.82
21	32.17x	26.75y	21.33y	1.45
46	31.33	32.00	29.66	1.09
74	30.83	33.50	31.33	0.59
110	32.16	34.25	33.33	1.21
Reduction in PCV(%) due to infection	-	20.00	19.49	0.12
Haemoglobin (g/dl)				
0	9.53	11.66	11.43	0.43
7	9.64	8.11	7.71	0.39
14	10.02x	5.29y	6.74y	0.68
21	9.04x	7.62y	6.32y	0.42
46	8.65	9.54	8.60	0.29
74	9.01	9.52	8.90	0.30
110	9.25	9.65	8.53	0.40
Mean	9.30	8.79	8.55	0.197
Reduction in Hb(g/dl) due to infection	-	7.34	8.28	0.02

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