

## Effect of butyric acid supplementation on rumen development in relation to fibre digestibility and VFA production

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The present investigation was planned to study the influence of butyric acid on fibrous fraction digestibility and concentration of volatile fatty acid (VFA) as indicators of rumen development in cow calves.

Fifteen 11-day-old Karan Fries crossbreed calves were allotted randomly on body weight (BW) basis to 3 groups of 5 each. Calves of group 1 (control) were fed whole milk @ 1/10th of their BW up to 1 month of age and thereafter 1/15th of BW, whole milk + 1/25th of BW skimmed milk up to 2 months of age. Calves of group 2 were kept on the same feeding schedule as in group 1 along with 6 ml butyric acid up to 1 month of age and thereafter only skimmed milk @ 1/10 th BW along with 6 ml butyric acid and ground maize up to 2 months of age. Calves of group 3 were fed only 1/10th of BW skimmed milk along with 6 ml butyric acid and ground maize from day 11 to 60 of age. Concentrate mixture and green fodder were fed *ad lib*. At 2 months of age calves of all the 3 groups were fed only concentrate mixture having 22.2% crude protein (CP) on DM basis for 10 days. Then samples of rumen liquor were collected 5 hr post-feeding with the help of a probe made of stainless steel inserted through mouth for total volatile fatty acid (TVFA) and individual fractions of TVFA determination. In the same way VFA estimation on green fodder feeding was done in calves by feeding only green berseem for 10 days before collection of rumen liquor. The determination of TVFA was done according to Scarisbrick (1952). Individual fractions of VFA were determined by the method of Erwin *et al.* (1961). Digestibility trial was conducted at 90 days of age to determine the digestibility of DM, NDF and ADF. The data were analysed statistically as per Snedecor and Cochran (1967). The chemical composition and the effect of different treatment on digestibilities of DM, NDF and ADF are presented in Tables 1 and 2. In the present study, there was no significant effect of treatment on DM, NDF and ADF digestibility, a finding consistent with Vidyarthi (1991). Nonsignificant effect of

Table 1. Chemical composition of feedstuffs (% DM basis)

Nutrients	Conc. mixture	Green berseem
CP	22.26	17.65
EE	4.11	2.79
NDF	27.70	46.17
ADF	15.40	38.84
NFE	54.49	48.62
ASH	9.92	10.42

treatment on DM digestibility showed that restricted milk feeding along with butyric acid had no adverse effect on the digestibility and hence the rumen was uniformly functional in all the calves irrespective of nature of feeding regimen. Slightly higher ( $P<0.05$ ) NDF and ADF digestibilities observed in group 2 might be due to better development of rumen as compared to calves in groups 1 and 3. Digestibilities of NDF and ADF depends upon the functional rumen, where the rumen micro-organisms show their activity by breaking down of fibrous components with the production of rumen metabolites, particularly VFA. On the contrary, where rumen is not developed, the breakdown of NDF is limited. It is evident from the present study that the apparent digestibility of fibre was quite satisfactory in all the 3 groups of crossbred calves.

The average concentration of TVFA on concentrate mixture feeding was 8.06, 9.23 and 9.00 m eq/100 ml strained rumen liquor (SRL) in calves of groups 1-3 whereas on green fodder feeding the corresponding values were 6.69, 8.42 and 6.64 g meq/100 ml SRL. TVFA concentration in SRL in both the cases of concentrate and green fodder feeding was highest in group

Table 2. Effect of feeding butyric acid on DM and fibre digestibilities

Parameters	Treatment			Level of significance
	1	2	3	
DM	62.03±2.18	62.54±2.18	60.52±2.99	NS
NDF	50.47±2.65	57.05±3.62	52.07±2.77	NS
ADF	45.24±1.33	48.40±2.24	44.52±1.29	NS

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Table 3. Production of individual VFA in SRL at 2 months of age in crossbred calves

Chemicals in feeds stuffs	Treatment			Level of significance
	1	2	3	
<i>Green fodder feeding</i>				
Acetic acid	68.84±1.79	72.10±1.97	71.49±1.53	NS
Propionic acid	17.15±1.92	16.32±0.90	17.63±1.05	NS
Butyric acid	14.01±0.79	11.57±1.08	10.88±1.39	NS
<i>Concentrate feeding</i>				
Acetic acid	66.78±1.01	61.64±2.90	56.95±3.88	NS
Propionic acid	18.09±1.56	20.16±1.76	26.23±4.11	NS
Butyric acid	15.13±1.57	18.19±1.62	16.82±0.79	NS

2. The results followed the same trend as observed by Vidyarthi (1991) who showed that TVFA concentration was higher in calves fed butyric acid as compared to calves fed propionic acid or whole milk. This increased TVFA concentration is also a good indicator of better rumen development attributable to the feeding of butyric acid. NDF, ADF digestibility and TVFA concentrations were higher in group 2 than in groups 1 and 3. This indicated better development of rumen of calves of group 2. Effect of different dietary treatments on proportion of individual VFA in SRL is presented in Table 3. Higher concentra-

tion of acetic acid on green fodder feeding in calves under group 2 indicated better development of rumen even though whole milk was stopped after 1 month of age. On concentrate feeding propionic acid proportion was highest in group 3 (26.23%) followed by groups 2 (20.16%) and 1 (18.09%) with the difference being nonsignificant. Even though milk feeding was stopped after 1 month, rumen development was not receded due to feeding of butyric acid. Rumen was fully developed at 2 months of age in crossbred calves as the concentration of VFA was comparable with the adult ruminant.

From the obtained results it is concluded that the DM and NDF digestibilities as well as the concentration of TVFA are good indicators of rumen development. Studies also showed that calves can be fed with restricted whole milk along with butyric acid without any adverse effect on rumen development.

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