

DIETARY INFLUENCES ON BACTERIOPHAGE NUMBERS IN THE RUMEN

A.V. KLIEVE, A.F. TURNER, and G.L. HECK

Dept of Primary Industries, Animal Research Institute, Yeerongpilly, Qld 4105

Bacterial lysis within the rumen is considerable and is a major source of feed utilization inefficiency. Bacterial viruses (bacteriophages) are implicated in this lysis. Bacterial viruses are obligate pathogens of bacteria and occur in dense populations in the rumen (Klieve and Swain 1993). Preliminary findings suggested that feed components affect phage activity. The aim of this study was to gauge whether diet type did have a marked influence on the size of the bacteriophage population in the rumen.

A survey was undertaken of the total phage numbers present in the rumen contents of beef cattle (*Bos taurus* and *Bos indicus*), dairy cattle and sheep fed diets of fresh forage, dry forage and grain, with and without a variety of supplements. The animals used were either fitted with a rumen cannula, through which rumen fluid was removed, or rumen contents were aspirated through a tube placed into the rumen through the mouth. Rumen fluid samples were processed and the total amount of bacteriophage DNA was determined as previously described (Klieve and Swain 1993). The results are summarized in Table 1.

Table 1. Total phage DNA ($\mu\text{g}/\text{ml}$ of rumen fluid) in rumen contents of beef cattle, dairy cattle, and sheep fed fresh forage, dry forage and supplements in various amounts as percent of liveweight (w)

Feed type	Supplement	Number and type of animals (S) - stomach tube sampled (C) - rumen cannulae sampled.	Av. total phage DNA ($\mu\text{g}/\text{ml}$)	s.e.
<i>Fresh pasture</i>				
Buffel grass		six beef cattle (<i>Bos indicus</i> X) (S)	14.83	3.69
Buffel grass	Sorghum, 2% w	two beef cattle (<i>Bos indicus</i> X) (S)	8.94	3.42
Buffel grass	CSM, 1.5% w	two beef cattle (<i>Bos indicus</i> X) (S)	10.32	0.42
Buffel grass		three beef cattle (<i>Bos indicus</i> X) (S)	5.65	3.90
Buffel grass	Sorghum, 0.8 to 2% w	three beef cattle (<i>Bos indicus</i> X) (S)	14.40	5.84
Kikuyu grass		nine beef cattle (<i>Bos taurus</i>) (C)	13.55	1.83
<i>Dry forage</i>				
Rhodes grass hay		three beef cattle (<i>Bos indicus</i> X) (S)	5.88	2.17
Rhodes grass hay	CSM, 0.5% w	three beef cattle (<i>Bos indicus</i> X) (S)	3.03	0.34
Rhodes grass hay	CSM, 1% w	three beef cattle (<i>Bos indicus</i> X) (S)	4.41	1.07
Rhodes grass hay	CSM, 1.5% w	two beef cattle (<i>Bos indicus</i> X) (S)	6.28	2.01
Rhodes grass hay	CSM, 2% w	three beef cattle (<i>Bos indicus</i> X) (S)	3.98	0.60
Rhodes grass hay	Fishmeal, 0.2 to 0.8% w	three beef cattle (<i>Bos indicus</i> X) (S)	3.81	1.36
Rhodes grass hay	Molasses, 1.5 to 2% w	three beef cattle (<i>Bos indicus</i> X) (S)	1.40	0.25
1:2 Lucerne:Rhodes	2 kg CSM	three beef cattle (<i>Bos indicus</i> X) (S)	6.11	3.15
1:3 Lucerne:Oatenhay		four sheep (C)	4.54	0.34
1:3 Lucerne:Oatenhay	Bentonite	three sheep (C)	5.48	1.71
Barley chop + Rhodes		three Friesian steers. (C)	5.32	2.11
<i>Grass Hay</i>				
<i>Feedlotted</i>				
Barley:Sorghum 60:24	High P: Ca	nine beef cattle (<i>Bos indicus</i> X) (S)	0.77	0.09
Barley:Sorghum 60:24	Low P: Ca	eight beef cattle (<i>Bos indicus</i> X) (S)	1.59	0.39

Animals feeding on green pasture tended to have high phage numbers whereas those on dry feed had fewer phage (30 to 50%), and feedlotted animals much fewer again (10% of those at pasture). This trend appeared to be unaffected by animal species or the feeding of supplements. The results suggest that the extent of phage activity in the rumen, and hence bacterial lysis, is influenced by the diet and if the triggers to the higher activities can be found it may be possible to reduce phage mediated bacterial lysis through dietary manipulation.

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