FACTORS AFFECTING THE RUMEN BACTERIOPHAGE POPULATION

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The bacteriophage population present in the rumen is diverse in composition and highly dynamic (Ritchie *et al.* 1970; Klieve and Bauchop 1988). The numbers and fluctuations in the population may play an important role in the turnover of microbial cells and supply of microbial products to the animal. Although the rumen bacteriophage population has been shown to contain a small proportion of classic lytic phages (these infect, then lyse cells), temperate phages are widespread among rumen bacteria (Klieve *et al.* 1989). Temperate phages infect bacteria and either lyse the cells or integrate their DNA into the bacterial chromosome and then exist from one generation to another as an integral part of the bacteria. Temperate phage are, however, capable of reverting to lytic development (termed induction) and thus are capable of causing large-scale lysis of bacterial populations.

The effect of changing environmental and nutritional conditions within the rumen upon the bacteriophage population is poorly understood. One possible impact of altering rumen conditions is induction of temperate phage, resulting in bacterial lysis. Secondary plant compounds, including tannic acid, saponin, sparteine, catechin, rutin, quercetin, and p-coumaric acid, and the feed additives bentonite and monensin, were tested to determine any possible effects on phage activity. Aqueous suspensions of individual compounds at concentrations of 0.01% to 1 .0% (wt/vol.) were incubated overnight with lysogenic cultures of *Prevotella ruminicola* subsp. *brevis (AR29)* and *Eubacterium ruminantium* (AR35). Differences in the numbers of phage particles present was deterrnined by phage DNA purification and quantitation (Swain *et al.* 1995).

Analysis of phage DNA concentrations indicated that none of the secondary plant compounds or feed additives tested caused induction of temperate phage from either strain of rumen bacteria. However, with the addition of 0.01%, 0.05% and 0.10% tannic acid, total extractable DNA was reduced to 70.89%, 17.37% and 0.00% of the control, indicating a decrease in the number of phage particles within suspension.

It appeared that tannic acid was able to bind to, and precipitate phage particles in suspension. In the *in vivo* situation where tannins can make up a significant proportion of the diet of grazing animals, tannins may bind to phage particles suspended within the rumen fluid, thus inhibiting attachment and infection of susceptible host bacteria. While phage in lysogenic and pseudolysogenic associations within the host cells would be protected from the tannins, activity of lytic phage and the rate of new phage infections may be considerably decreased. Therefore, it is possible that tannins at low concentration may improve protein flow from the rumen by reducing lytic phage activity, and hence bacterial lysis in the rumen.

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