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Summary

RUMEN STUDIES IN SHEEP

LEVELS OF MICROBIAL END-PRODUCTS

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CONSIDERABLE INFORMATION on rumen metabolism of feed has been obtained *in vivo*, but nearly all studies have been concerned with animals in pens fed artificial diets of low moisture content and of unknown composition. The animals are usually given a fixed amount of feed to be consumed within one hour and the effects on rumen microbial end-products are measured for the next few hours.

The free-grazing animal eats at irregular intervals and for varying lengths of time throughout the day; the intake at any grazing period cannot be measured; and feed is selected of different composition from that of the total sward.

It is therefore evident that rumen levels of end-products cannot be related to the feed consumed under free-grazing conditions.

The possibility remains, however, that similar results may be obtained from sheep in pens fed fresh grass of known composition and from grazing sheep, provided that:

- (1) The time of feed consumption in the field is the same as that in pens.
- (2) The effects of feed composition and intake level can be distinguished.
- (3) It is possible to cut grass which approximates in composition to that selected in the field, irrespective of when or where it is obtained.

During the past few months at Ruakura a series of trials in pens has been conducted, feeding fresh cut grass at three stages of growth and at the same level of dry matter. Rumen samples were taken before and following the morning feed and analyzed for ammonia, volatile fatty acid, protein N, and free microbial count.

Differences were shown in peak and pre-feeding concentrations in the fermentation curves and also differently shaped curves for volatile fatty acids.

In order to differentiate these effects from those of intake level, it was necessary to study results of intake level alone.

The results show that peak and succeeding concentrations of ammonia and volatile fatty acid can be affected both by feed level and by different feeds. However, feed composition seems to alter pre-feeding concentrations much more than the amount

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fed and also the rate of rise and fall of the curves is unaffected by feed level.

A preliminary study has also been carried out on the effect of limited grazing on the concentration curves. One group was fed fresh grass in pens for one hour night and morning. At the same times a second group was allowed to graze, while a third group was grazed continuously. The ammonia and volatile fatty acid curves for pen feeding and limited grazing follow a similar pattern, but the free-grazing group shows a fairly even concentration, slightly higher than the peak concentration for the other groups. The level of protein N for the free-grazing group was very much higher.

A detailed examination of the data shows that certain effects of feed composition may be differentiated from those of intake level and that the limited grazing technique may be a means of obtaining useful information in the field by relating the curves obtained to those from grass of known composition fed in pens.

DISCUSSION

Q: : *How do you propose interpreting these various curves, bearing in mind that you are measuring merely a difference between the rate of production and the rate of absorption. Can one rely on the figures obtained when so many variations can occur?*

A: : First of all, unless we can show much larger differences in the curves between pastures at different times of the year and at different stages of growth within any season, it is unlikely that this technique will yield information of value. If we can show that large differences do occur, we intend to try to reproduce the curves in pen feeding trials in which we can relate the curves to the composition of the feed. This stage will certainly involve measuring the proportion of volatile acids in both the rumen and the blood. We also think that this type of technique will give us valuable information about the feed selected by the grazing animal. We do not think we can get it by the techniques such as the artificial rumen which are at present in use.

Q: : *Have you obtained any indications that variations in the end products of metabolism are associated with variation in the dry matter content of the feed, that is, in the free-grazing animal?*

A: : When the restricted grazing technique is applied to sheep, the end products showing dilution after feeding in pens also show dilution. We have other evidence that this dilution is mainly due to saliva and not to the moisture content of the feed. It would be difficult to study the effect of moisture content of feed in the free-grazing animal.

Q: : *It might be more profitable to consider the relative proportions of the fatty acids.*

A: : I agree, and this will be done during the pen feeding work we have planned.

Q: : *I recently had an interesting experience, on which Mr. Williams might be able to throw some light. Some hoggets which had been grazing almost 100 per cent. lucerne showed typical unthriftiness and when opened up it was found that there was virtually no fermentation going on at all.*

A: : I have had no similar experience. We have been unable to detect any fact of significance in the rumen of unthrifty hoggets. However, we have had a few cases of very abnormal function in calves, owing, we think, to milk going directly into the rumen.