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TURNOVER OF PROTOZOA AND BACTERIA-IN THE RUMEN OF SHEEP

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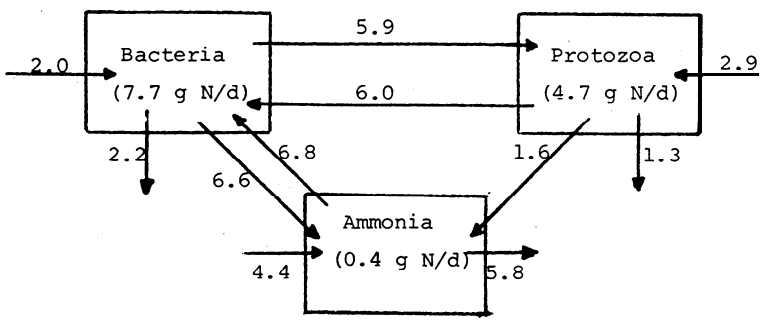
Evidence that protozoa, which may represent an appreciable proportion of the microbial biomass in the rumen, are preferentially retained in the rumen, and that they engulf bacteria, suggests that their, presence may result in reduction in the availability of microbial protein to the animal.

In order to understand the role of protozoa in the ecology of the rumen, and to study the difference between total microbial protein synthesis and the flow of microbial protein out of the rumen, a compartmental model approach based on studies with the tracer ^{15}N was taken. Sheep were fed hourly 13 g oaten chaff (0.9% *N*) and 14 g sugar mix containing 3% urea and 0.5% Na_2SO_4. This diet resulted in a high level of protozoa in the rumen (10^6/ ml). One sheep received a continuous intraruminal infusion of $^{15}NH_4Cl$ over 36 h. Sampling and determining the ^{15}N enrichment in the rumen pools enabled the rate of irreversible loss of rumen ammonia and the proportions of bacterial and protozoal *N* derived from ammonia to be estimated. A sample of this animal's rumen digesta was fractionated and ^{15}N-labelled bacteria and protozoa were injected separately into the rumens of other sheep. The changes in the enrichment of ^{15}N in all compartments, in each of the sheep, enabled a model to be described and gross and net protein production to be calculated as shown in the Figure.



The preliminary results indicate that on this diet protozoa were about 38% of the rumen microbial biomass. There was considerable interchange of *N* between the bacterial and ammonia pools, probably due to lysis of bacteria by cytoclastic mycoplasma and bacteriophage activity. Moreover there was a high recycling between the bacterial and protozoal pools such that less than 50% of the gross incorporation of *N* into bacteria and protozoa subsequently flowed out of the rumen in microorganisms. Since engulfment of bacteria by protozoa is probably part of the reason for this inefficiency, it is suggested that manipulation of rumen conditions so as to reduce internal cycling, for example by defaunation or increasing flow rates, may improve net availability of protein from the rumen and thus lead to improved animal production.

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