DIURNAL CHANGES IN CHEMICAL COMPOSITION OF RUMEN BACTERIA IN VIVO

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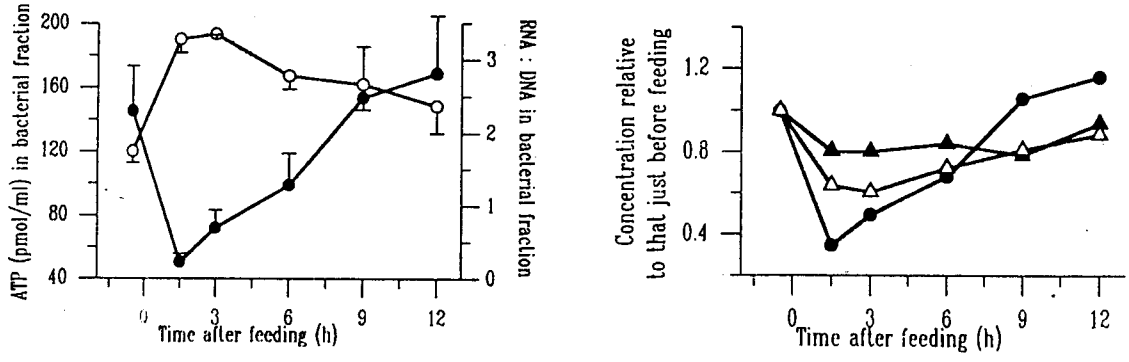
Change in specific growth rate of bacteria is associated closely with change in the ratio of RNA:DNA (Koch 1970) and this appears to be true also of mixed populations of rumen bacteria in vitro (Isaacson et al. 1975) and in vivo (John 1984).

To determine diurnal changes in the chemical composition of rumen bacteria rumen digesta was collected at intervals during the day on three consecutive days from a merino wether fed oaten hay (0.85), lupins (0.10) and minerals (0.05). He was trained to consume his ration (750 g dry matter/d) within two hours of feeding. Chromium-EDTA was infused continuously through the rumen cannula. The supernatant remaining when strained rumen fluid (SRF) was centrifged at 150xg for 10 min was designated the bacterial fraction. Concentrations of chromium in SRF, and of DNA, RNA, ATP, dry matter and protein in the bacterial fraction were determined.



RNA:DNA (O), ATP (O) and dry matter (Δ) in the bacterial fraction, and Cr in SRF (Δ) with time after feeding. Vertical bars indicate standard errors.

RNA:DNA in the bacterial fraction increased sharply and then fell with time after feeding, but the contents of ATP and dry matter decreased after feeding and then rose. Change in rumen volume with feeding, judged by dilution of Cr-EDTA, was insufficient to account for these changes (see figure). John (1984) found that a similar increase in RNA:DNA was associated with increases in rate of fermentation and the concentration of bacteria in rumen fluid. The ATP content of the bacterial fraction reflects the biomass of viable rumen bacteria. A decrease in bacterial biomass with increases in specific growth rate, cell numbers and rate of fermentation following feeding appear anomalous unless they reflect increases in the numbers of small bacteria which individually contribute less to the biomass of rumen bacteria than do the large bacteria.

ISAACSON, H.R., HINDS, F.C., BRYANT, M.P and OWENS, F.N. (1979). Fed. Proc. 38: 2707.
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