CONTRIBUTION OF PROTOZOA AND ANAEROBIC FUNGI TO DIGESTA N IN SHEEP GIVEN A PELLETED HAY/GRAIN DIET

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Although information is available on the contributions of bacteria and protozoa to rumen digestion and nutrient supply, lack of adequate methods has limited knowledge of the contribution of the anaerobic fungi. We report here data obtained using a synthetic oligonucleotide probe for fungal DNA (A.G. Brownlee, unpublished) and compare them with data for protozoa.

Two 6-year-old Border Leicester x Merino wethers fitted with rumen and abomasal cannulae were given continuously a pelleted mixture of lucerne hay and oat grain (3:2) at 718 g DM/d. The diet contained (g/kg DM): OM 931, DOM 699, N 24.7; 2 g NaCl and 7 g $CaHPO_4.2H_2O$ were added per kg prior to pelleting. Protozoal turnover was measured (Leng 1982; Faichney 1989) and samples were taken for fungal DNA analysis during a continuous infusion of ^{51}CrEDTA and ^{103}Ru-phen for the measurement of digesta pools and flows (Faichney 1980). Fungal zoospores in fluid were counted after culture in roll tubes (Phillips and Gordon 1989). Cultured fungal DM contained 6.54% N.

		Sheep 1	Sheep 2
Rumen fluid protozoa (10^6/ml)		3.86	4.52
(% small (< 100 μm) Entodinia)		67.1	76.8
Rumen fluid fungal zoospores (10^4/ml)		1.45	0.82
Abomasal fluid fungal zoospores (10^2/ml)		1.3	1.4
Rumen pool:	Non-ammonia N (g)	24.3	26.9
	Protozoal N (g)	19.2	21.2
	Fungal N (mg)	16	18
Flow to duodenum:	Non-ammonia N (g/d)	12.8	11.4
	Protozoal N (g/d)	6.9	7.1
	Fungal N (mg/d)	15	8
Solute mean retention time (h)		12.0	17.7
Particle mean retention time (h)		43.7	75.1
Protozoal mean retention time (h)		66.8	71.7
Protozoal degradation rate (%/h)		1.37	1.78

The very high protozoal counts were associated with very high contributions to non-ammonia N in the rumen (79%) and duodenum (58%). By contrast, anaerobic fungi contributed an insignificant amount of N. Values for digesta samples appeared low relative to fluid sub-samples, suggesting that DNA recovery from particles was incomplete. Assuming 2 ng DM/zoospore, the zoospore counts (colony forming units) in digesta fluid were 38% (rumen) and 17% (abomasum) of the fungal DM measured by DNA probe, a finding consistent with the view that colony forming units do not necessarily account for all the fungal DNA present. Work is in progress to confirm these results and extend them to forage diets which support much smaller protozoal populations and larger fungal populations.

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