Phenolic-rich extracts from *Acacia nilotica* reduce nitrogen utilisation in sheep

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The possibility that phenolics may be absorbed into the bloodstream and interfere with nitrogen (N) metabolism has been largely ignored in ruminants. It has been suggested that the absorption of phenolics by mammals induces a metabolic acidosis, the result being that plasma amino acids are wastefully degraded by the kidney to provide HCO_3^-, leaving amine groups to be excreted as NH_4^+ rather than urea (1). We tested the hypothesis that the intake of absorbable phenolics results in a reduction in the efficiency with which absorbed nitrogen is retained and that indirect indicator of this change is a shift in the form of N excretion in urine from urea to NH_4^+.

In a crossover design, six wethers (38-46 kg liveweight) were infused intraruminally with either a crude aqueous extract of phenolics (predominantly catechin gallates at 16 g/L) from *Acacia nilotica* (Prickly Acacia) foliage or water. The infusate was given in 5 equal aliquots spaced evenly between 0800 and 1700h each day, the amount totally 1 L/d, for 10 consecutive days. All the wethers received a basal diet, continuously fed from an automated feeder over the same time period as the infusions, that comprised ryegrass hay 420 g/d and cracked barley 280 g/d as fed (ME = 11.56 MJ/kg DM, CP = 17.2 % DM). Nitrogen retention was determined from day 6 to 10 of the infusion period by the total collection of excreta, and concentrations of urine urea and NH_4^+ determined daily and averaged over the same period.

Infusate:	Truly digested N %	N retention, g/d	Urinary N g/d	Faecal N g/d	Efficiency of use of digested N	Urine urea-N g/d	Urine NH_4^+-N g/d
Phenolics	80.8	5.48	8.30	5.17	0.560	4.60	0.82
Water	84.2	6.87	7.55	4.52	0.623	4.24	0.80
s.e.m.	0.8	0.365	0.374	0.150	0.022	0.348	0.10
significance	P=0.02	P=0.02	P=0.19	P=0.01	P=0.07	P=0.48	P=0.87

The phenolic-rich infusion reduced N retention by 20 %. This was due to a reduction in both the amount of N digested and the efficiency with which the digested N was converted into tissue. However, the reduction in efficiency of conversion was not associated with a shift in the form of urinary N excretion from urea towards NH_4^+. This contrasts with the dramatic shifts previously reported in mammals such as possums in response to high-phenolic diets (1). Our focus now is to understanding why the response of sheep to phenolic loads might differ from other mammals.

We conclude that even small amounts of dietary phenolic can have a measurable influence on the efficiency of utilisation of absorbed N, in addition to their more commonly documented effects on N digestion.

1. Foley WJ, McLean S, Cork SJ. Consequences of biotransformation of plant secondary metabolites on acid-base metabolism in mammals- a final common pathway? J Chem Ecol 1995;6:721-44.