DIMINISHED RENAL UREA EXCRETION IN THE LLAMA AT REDUCED FOOD INTAKE

W.Engelhardt and W.v.Engelhardt
Stuttgart - Hohenheim, Germany

Renal urea excretion was studied in three llamas during the following experimental conditions: (1) control (hay ad lib.), (2) 40% reduction in the amount of hay, (3) 60% reduction in hay, (4) straw ad lib., (5) straw ad lib. plus supplementation with $10 Kcal/kg^{0.75}$ + 6g digestable protein per day. Water and mineral lick were available all the time. The animals were adapted to the various diets for at least 2 to 4 weeks. The animals were kept on the straw diets for a total period of up to 24 weeks. Even at this straw diets the llamas lost only 5-9% of body weight. In the male animals urine was sampled with a funnel or a beaker; in the female animals a bladder catheter was used. Glomerular filtration rate (GFR) was estimated from inulin clearance. The tubular reabsorbed urea is the difference between the glomerular filtered and the renal excreted urea. Results (± S.D.) are presented in the following table.

diets	hay ad lib. (control)	40% red.	60% red.	straw	straw+suppl.
llamas	A + B + C	A + B	A + B	A + B	C
plasma urea concentration (mmol/l)	5.7± 1.1	6.7± 1.1	7.2± 1.5	5.9± 0.9	5.9± 0.8
renal urea excretion (mmol/h)	19.0± 8.3	17.5± 2.8	16.4± 4.9	14.5± 4.8	4.2± 3.4
renal urea clearance (ml/min)	54.0±23.4	44.3± 7.0	38.3±10.4	43.0± 17.5	10.0± 8.9
GFR (ml/min)	102.6±14.4	76.5±12.0	72.6±13.1	68.1± 16.1	75.5±12.4
glom.filt.urea (mmol/l)	35.2± 7.4	30.8± 7.7	31.4± 8.4	23.4± 3.9	27.2± 6.3
fraction filt.urea excreted (%)	53.1±23.4	59.5±15.0	53.5±14.8	64.1± 23.7	13.2±11.3

Plasma urea concentration was significantly increased when feeding was reduced by 40% and by 60%; during the straw diets blood urea concentration was not significantly different from the control experiments.

It was quite unexpected that compared with the control during reduced hay feeding and also during the straw diet the renal urea excretion was only slightly and insignificantly decreased. Only in one llama C where a comparatively small amount of energy was added to the straw the renal urea excretion decreased to very low values. Plasma urea concentration by no means reflect these changes.

Within the kidney GFR as well as tubular reabsorption result in the amount of urea excreted in the urine. GFR and thereby glomerular filtered urea was at an average 30% lower at reduced feeding and at the straw diets than during the control experiments. Due to the higher plasma urea concentration during reduced feeding the glomerular filtered urea was not markedly diminished; during the straw diets the glomerular filtered urea was significantly less than during control. Except during the last experimental condition (straw plus supplement) the fraction of filtered urea that was reabsorbed in the tubules was rather constant (36% to 47%). The very high tubular reabsorption we had expected during these conditions was seen only in llama C during the straw diet with a moderate supplementation of some carbohydrates. In this case 87% of the filtered urea was reabsorbed in the tubules.

So far we do not know the releasing mechanism that switches over towards high tubular reabsorption of urea. It is very likely that the permeability for urea is changed in the collecting duct. Concerning protein metabolism the advantage of this regulation is evident; although llama C was on this low protein diet for nearly half a year it lost only 5% of its body weight during this period.