

## **Is the renal haemodynamic response to amino acids present in sheep?**

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In many omnivores and carnivores, GFR and renal blood flow (RBF) rise by up to 50% following ingestion of a protein-rich meal or i.v. infusion of amino acids<sup>1</sup>. The elevation in GFR is dose-dependent<sup>2</sup>, and is associated with a reduction in renal vascular resistance (RVR). We wanted to determine whether similar responses occur in sheep, so that we could use amino acids to measure renal reserve in lambs and adult sheep in our developmental studies. Catheters were chronically implanted into 7 nonpregnant sheep under general anaesthesia (1g thiopentone i.v.; 1-3% halothane in oxygen). On experimental days the bladder was catheterized. After a control period, ewes were infused with a mixture (1:1:0.6:0.6) of alanine, glycine, proline and serine in saline (0.075mmol/kg/min, 1mL/min for 1h, then 0.12mmol/kg/min, 1.7mL/min for 2h). Surprisingly, there were no changes in GFR or effective RPF at either dose. The only changes seen during low dose were decreases in plasma electrolytes. At the higher dose, ewes became hypotensive and tachycardic, and RVR fell from  $0.15 \pm 0.03$  to  $0.09 \pm 0.01$  mmHg/min/mL ( $P < 0.05$ ). They developed an osmotic diuresis, and an increase in total haemoglobin levels suggests that they became volume contracted. Sodium reabsorption did not change, but fractional proximal sodium reabsorption fell from  $86.2 \pm 1.4$  to  $71.3 \pm 3.9\%$  ( $P < 0.005$ ), and there was a compensatory increase in distal reabsorption. Overall fractional sodium reabsorption fell from  $99.9 \pm 0.04$  to  $98.5 \pm 0.4\%$  ( $P < 0.005$ ). Thus the sheep did not demonstrate the characteristic increase in GFR and RBF seen in other species in response to amino acids. Although increasing the dose led to a fall in RVR, the most striking effect of the high dose was an osmotic diuresis. We speculate that, because of the ruminant diet and protein metabolism, the capacity of the sheep kidney for handling large fluctuations in plasma amino acids is, at best, limited. Much lower doses may be necessary to elicit a response in this species.

(1) Rodriguez-Iturbe et al. (1988). *Clinical Science* 74:11-15.

(2) Woods et al. (1993). *Kidney International* 44:659-675.