

## CREATINE NUTRITION AND METABOLISM IN SHEEP

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Quantitative nutritional studies have been made in a number of animal species in recent years using surgically prepared multicatheterized animals to study the output of nutrients from digestive tract and metabolism by body organs. However, no such investigations on creatine nutrition and metabolism have been reported to date. In this study, we determined net gut output and hepatic production of creatine in sheep. Daily urinary excretion of creatine and creatinine was also measured to serve as an index for creatine turnover.

Merino ewes (approx. 60 kg) were surgically prepared with multiple catheters and kept in metabolic crates. They were fed 1000 g/day of lucerne chaff with free access to water. Net gut output and hepatic production of creatine were determined from measurements of blood flow and venoarterial concentration differences. Five sets of blood samples were simultaneously withdrawn from the aorta, portal and hepatic veins in each animal at 10-min interval for analysis of creatine. Creatine was assayed by  $\alpha$ -naphthol-diacetyl method and creatinine was measured by ion-exchange chromatography using a high performance liquid chromatograph.

## Net gut output, hepatic production and urinary excretion of creatine in sheep

sheep	Net gut output	Net hepatic production	Urinary excretion	
	creatine	creatine	creatine	creatinine
1	0.54 ± 1.21	8.99 ± 0.89*	6.41	10.75
2	1.21 ± 2.28	17.00 ± 3.07*	6.93	10.23
3	0.49 ± 0.79	11.99 ± 2.88*	3.03	13.35
Mean	0.75	12.66	5.46	11.44

Values are expressed as mmol/24 h and the values for net gut output and net hepatic production are means ± SEM for 5 sets of observations. \* P<0.01.

Net gut output was calculated by

$$(\text{Portal vein conc.} - \text{Artery conc.}) \times \text{Portal blood flow.}$$

Net hepatic production was calculated by

$$\text{Hepatic vein conc.} \times \text{Hepatic blood flow} - (\text{Portal vein conc.}$$

$$\times \text{Portal blood flow} + \text{Artery conc.} \times \text{Hepatic arterial blood flow}).$$

We demonstrate that sheep derive no significant amount of creatine from digestive tract. Hepatic synthesis of creatine in these experimental sheep was about 13 mmoles per day. This amount accounts for 75 % of the total urinary excretion of creatine and creatinine.

These results suggest that plant material and ruminal microbes provide virtually no creatine and sheep rely on the endogenous synthesis of creatine. This is in contrast to humans and carnivorous and omnivorous animals, where dietary creatine may make an equally important contribution to daily turnover of creatine (Snoswell and Xue, 1987).

SNOSWELL, A.M. and XUE, G.P. (1987). *Comp. Biochem. Physiol.*, in press.

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