

THE ENDOGENOUS URINARY PHOSPHORUS EXCRETION OF PRERUMINANT LAMBS

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The major route for the excretion of phosphorus (P) in most domestic animals is via the faeces. However, in preruminant lambs, Walker (1972) showed that the urine is an important route for P excretion. In those early experiments the lowest urinary P excretion was 28 mg/kg d⁻¹. This value was obtained with two lambs given a low-calcium (Ca) diet with intakes of 3.4 mg Ca and 31 mg P/kg d⁻¹. In another experiment the minimum urinary P excretion was 34 mg/kg d⁻¹. This value was obtained by extrapolation to zero P intake of the rectilinear relationship between P intake and urinary P excretion (n = 9; intakes of 87-308 mg Ca and 68-240 mg P/kg d⁻¹). These values were both considerably greater than the value of 1.5 mg/kg d⁻¹ for the endogenous urinary P loss of sheep, as adopted by the ARC Working Committee on the Nutrient Requirements of Ruminants (Agric. Res. Council. 1980). However, at that time it was difficult to devise milk replacers for preruminants that were nutritionally adequate, but low in P content. The main proteins used in artificial milks are from cows' milk or from the soybean, and contain appreciable amounts of P (casein, 8.9 g/kg dry matter; isolated soybean protein, 14 g/kg dry matter). However, it has now been shown in experiments in our laboratory that dried whole beef blood, when prepared under carefully controlled conditions, and supplemented with methionine and isoleucine, can be incorporated into milk replacers; it is then of high nutritive value and has relatively low content of P (0.88 g/kg dry matter).

Twenty-four male crossbred lambs, aged 2-5 d at the start of the experiment, were used in a 2 x 4 factorial design (two levels of protein, 0.10 and 0.25 protein of total energy derived from dried whole beef blood; four ratios of Ca:P, 0.5:1; 1:1; 2:1; and 10:1). Gross energy intake was 880 kJ/kg^{0.73} d⁻¹. Urine and faeces were collected separately on each day of the 21 d experimental period.

Performance of preruminant lambs given low P diets

Protein energy from dried beef blood	0.10	0.25	SE
Number of lambs	12	12	-
Mean liveweight (kg)	5.1	5.3	0.3
Nitrogen intake (mg/kg d ⁻¹)	367	1051	21
P intake (mg/kg d ⁻¹)	2.3	6.2	0.1
Faecal P (mg/kg d ⁻¹)	3.1	4.1	0.4
Urinary P (mg/kg d ⁻¹)	0.7 ^A	0.6	0.2
P balance (mg/kg d ⁻¹)	-1.7	1.7	0.5

^A n = 11, range 0.4-0.9 mg/kg d⁻¹; one lamb excreted 3.2 mg/kg d⁻¹.

There was no correlation between P intake and either urinary P or faecal P excretion. Mean values ± SE were: urinary P (n = 23), 0.6 ± 0.2; faecal P (n = 24), 3.6 ± 0.3. While the total P loss of 4.2 mg/kg d⁻¹ was in agreement with that proposed by the ARC for milk-fed lambs and calves, the urinary P loss was considerably lower than their value of 1.5 - 2.0 mg/kg d⁻¹.

AGRICULTURAL RESEARCH COUNCIL (1980). 'The Nutrient Requirements of Ruminant Livestock'. (Commonw. Agric. Bur:Farham Royal).

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