

CALCIUM KINETICS AND ABSORPTION IN NORMAL AND MAGNESIUM-DEFICIENT SHEEP

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The hypocalcaemia which often occurs concurrently with hypomagnesaemia may be a precondition for the development of grass tetany in ruminants (Baker *et al.* 1979). The aim of the experiment described here was to test *in vivo* whether calcium (Ca) absorption was decreased during magnesium (Mg) deficiency. This absorption study was carried out on three sheep first during a control period and then a second time after a one month period of magnesium depletion. Magnesium depletion was induced by means of an artificial milk diet infused into the abomasum. The daily ration of 2:1 of milk contained 392 g of spray-dried cow's milk and 8 g of a mineral-vitamin mix. This gave a daily intake of 4.0 g of Ca, and 0.43 g Mg. During the control period the sheep received daily an additional 1.5 g Mg as $MgCl_2 \cdot 6H_2O$. When fed the control diet, the sheep maintained normal plasma levels of Ca (10 mg/100 ml) and Mg (2.0 mg/100 ml). During magnesium depletion, plasma Mg fell to between 1.0 and 0.4 mg/100 ml while plasma Ca remained normal (100 mg/100 ml).

Gastrointestinal Ca transport was studied with two tracers given simultaneously; ^{45}Ca intravenously and ^{47}Ca injected into the abomasum via a cannula. Blood samples were taken at two-minute intervals for 30 minutes and then at increasing intervals up to one week. The kinetic data were analysed by means of the SAAM27 computer program (Berman and Weiss 1977). The rate of initial entry (absorption) of ^{47}Ca was calculated by fitting the observed plasma ^{47}Ca and ^{45}Ca curves directly to a simple compartmental model using methods described by Birge *et al.* (1969).

The kinetics of the calcium absorption model in sheep are characterised by an initial delay phase of 8-10 minutes, followed by a maximal rate of absorption at 20-60 minutes after abomasal injection. Absorption was 95% complete within 5 hours. A biphasic-shaped absorption curve was observed indicating a dual system of calcium absorption. This necessitated the use of at least two compartments to describe the absorption system. The percentage of administered ^{47}Ca absorbed as calculated with the model did not indicate any consistent trend suggestive of decreased Ca absorption during Mg depletion.

TABLE 1 Absorption of calcium in control and magnesium-depleted sheep

	CONTROL		MAGNESIUM-DEPLETED	
	Plasma Mg mg/100 ml	% ^{47}Ca Absorbed	Plasma Mg mg/100 ml	% ^{47}Ca Absorbed
SHEEP 1	2.10	26.7	0.60	36.0
SHEEP 2	1.80	27.6	1.10	41.1
SHEEP 3	1.90	29.8	1.00	22.8

If hypocalcaemia is involved in the aetiology of hypomagnesaemic tetany it is not due to the direct effect of Mg deficiency upon the absorptive system.

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