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SHORT COMMUNICATION

Amylin causes hypocalcaemia in lactating goats

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INTRODUCTION

Amylin is a 37-amino acid peptide, structurally related to calcitonin-gene-related peptide (CGRP), adrenomedullin and calcitonin (CT). It is co-secreted with insulin from the pancreatic β -cell. There is increasing evidence from rodent models that amylin may play an important role in the regulation of mineral metabolism, particularly Ca (Cooper, 1997). However, such a role has never been investigated in a ruminant model. The aim of this study was, therefore, to investigate a role for amylin in the regulation of Ca and metabolism of other minerals in lactating goats.

MATERIALS AND METHODS

Six lactating goats were infused with rat amylin (320 pmol/kg LW/h; Lot No. ZM 275; Bachem California, Torrance, CA, USA) via an external pudic (mammary) artery for 6 h during 14 h of frequent (2 hourly) milking. Each goat also received a control infusion of saline on a separate occasion within one week of amylin infusion. Amylin and saline infusions were carried out in random order for each goat. The day before the experiment, a catheter was placed in a jugular vein of each goat for blood samples. Blood samples were taken hourly to assess response in blood Ca, phosphate (PO_4) and magnesium (Mg). Mammary blood flow (MBF) in the infused artery was monitored continuously using a transit-time blood flow probe (Transonic System Inc., Ithaca, New York, USA) throughout the 14 h experimental period.

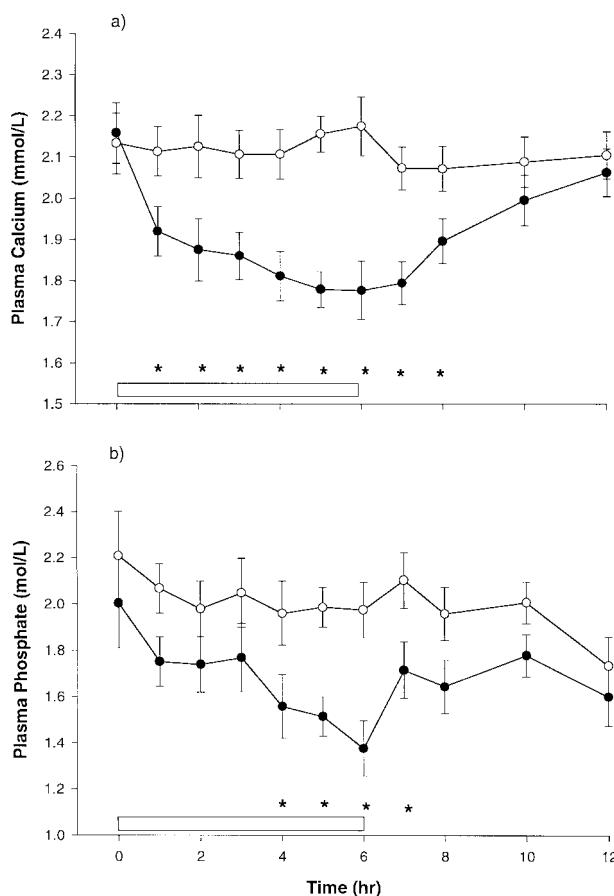
Data were subjected to multivariate (repeated measures) analysis of variance to test the effects of treatment, time (repeated factor) and their interaction using GLM procedures of SAS (1986). All data were presented as least square means and standard errors.

RESULTS AND DISCUSSION

Plasma concentrations of Ca and PO_4 were significantly ($P<0.05$) reduced from 1 h and 4 h of infusion, respectively, but returned to the baseline by the end of study (Figure 1a, 1b). These are consistent with those of previous studies (Cooper, 1997) with rodents and provide the first evidence that rat amylin is also a potent hypocalcaemic and hypophosphataemic agent in ruminants. In contrast to Ca, amylin had no effect on plasma concentrations of Mg (data not shown).

MBF in amylin-infused group was significantly ($P<0.01$) elevated in the first 3 h of infusion, but was

FIGURE 1. Effects of close-artery infusion into the mammary gland of saline (○) and amylin (●) on plasma concentrations of Ca and PO_4 in lactating goats. Drawn box represents infusion time. Vertical bars represent the standard error of the mean. * $P<0.05$.



similar to saline group thereafter (data not shown). This result is consistent with previous reports (Cooper, 1997), where members of the CT family act as potent vasodilators in a number of tissues, including mammary glands.

Milk yield (pooled together within animal) was not affected by amylin infusion (data not shown).

In conclusion, rat amylin is a potent hypocalcaemic, hypophosphatemic and vasodilatory agent in lactating goats. However, it remains unclear whether these effects are physiologically relevant, given that plasma concentrations of amylin during infusion were in the range of 250–300 pg/ml, these values representing about six-fold increase relative to baseline before infusion. Therefore, it will be necessary to examine potency of ruminant amylin to verify the present results.

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ACKNOWLEDGEMENT

This study was supported by Foundation for Research Science & Technology of New Zealand. The authors are grateful to Roger Dean at No. 5 Dairy Farm for care of experimental animals.

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