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Regulation of Stomach Emptying in Pigs

PC Gregory, M McFadyen, DV Rayner (Rowett Research Institute, Aberdeen, AB2 9SB)

We have suggested that short-term control of food intake in the pig may be related to the control of stomach emptying (Gregory and Rayner, 1986). It was previously shown that stomach emptying after a meal is exponential in pigs (Low, Pittman and Elliott, 1985), which suggests that stomach emptying is not calorically regulated. We now report studies into the mechanisms regulating stomach emptying during the feeding period.

Pigs (30 kg) prepared under halothane (1-3% as necessary) anaesthesia with a stomach cannula and a duodenal catheter were fed a barley-based ration, with digestible energy value (DE) 13.01 MJ/kg, mixed 1:2 with water containing CrEDTA, and trained to eat meals within 45 mins twice daily. Stomach emptying of solids and liquids was measured using a gastric evacuation technique. Over the period the animals ate their meal, there was linear emptying of dry matter (DM, 10.6 +/- 0.2 g/min, mean +/- S.E.M.) and liquids (68 +/- 6 ml/min), emptying beginning soon after feeding began (mean intercept of DM was 1.5 +/- 0.8 mins and for liquids 0.4 +/- 1.6 mins).

In a separate experiment, glucose (40%, 8 ml/min) was infused into the duodenum in pigs fed a meal containing 780 g DM and 1.8 l water. When the infusion began at 0, 10, 20 and 30 mins before feeding, and continued until the end of feeding, there was a progressive slowing in the rate of stomach emptying. Liquid emptying fell from a control value of 41 +/- 4 to 38 +/- 6, 31 +/- 5, 29 +/- 3 and 27 +/- 3 ml/min respectively; meanwhile DM emptying fell from a control value of 5.1 +/- 0.2 to 2.8 +/- 0.3, 1.8 +/- 0.4, 1.1 +/- 0.2 and 0.9 +/- 0.3 g/min respectively. The total duodenal energy flow (kJ/min) during the period of feeding (the DE value of the DM emptied plus the glucose infused) was the same for control (77 +/- 4) and for infusions beginning at 0 mins (79 +/- 6), but fell progressively with infusions beginning at 10, 20 or 30 mins prior to feeding (64 +/- 6, 51 +/- 3 and 47 +/- 4 respectively).

In a further experiment, in pigs fed a meal of 1210 g DM and 2.8 l water, duodenal infusion of glucose from 0 mins till the end of feeding caused caloric regulation of stomach emptying. With glucose infusions at 0, 2, 4, 6 and 8 ml/min, the rates of liquid emptying were 52 +/- 4, 47 +/- 2, 47 +/- 5, 44 +/- 3 and 40 +/- 4 ml/min respectively; meanwhile the rates of DM emptying were 7.4 +/- 0.5, 6.9 +/- 0.5, 6.4 +/- 0.7, 5.6 +/- 0.4 and 5.0 +/- 0.5 g/min respectively. This represented total duodenal energy flows of 112 +/- 8, 114 +/- 7, 114 +/- 11, 112 +/- 6 and 112 +/- 8 kJ/min respectively.

These results show that, during the feeding period, there is linear emptying of solids and liquids. Duodenal infusions of glucose during this period cause immediate caloric regulation of emptying, probably via a neuronal mechanism.

References

Gregory, P.C. and Rayner, D.V. (1986). *J. Physiol.* **378**, 25P.

Low, A.G., Pittman, R.J. and Elliott, R.J. (1985). *Br. J. Nutr.* **54**, 437-447.