93. Plasma β-endorphin and LH during prolonged hypoglycaemia in ewes

A. Eloy and R. G. Rodway, *Department of Animal Physiology and Nutrition, University of Leeds, Leeds LS2 9JT*

As part of a study of the influence of low blood glucose on reproductive function, the effects of prolonged insulin-induced hypoglycaemia was studied in eight ovariectomized ewes. Animals were penned individually and kept under 12 h light/12 h dark. Each trial lasted 2 days. On the 1st day ewes received saline infusions (0·7 ml/min) into the jugular vein for a 12-h period beginning 06.00 h. On the 2nd day they received insulin (2 mU/min per kg) in saline for the same length of time. On both days blood samples were taken from jugular catheters at 15-min intervals from 4 h after the start until the end of the infusion. Samples were analysed for glucose, β-endorphin and LH. Insulin reduced plasma glucose levels (1·1 (s.e. 0·1) *v.* 3·0 (s.e. 0·1) mmol/l) and increased β-endorphin (410 *v.* 278 ng/l). Analysis of β-endorphin and LH pulse frequency and amplitude using 'Munro endocrine pulse analysis' showed β-endorphin pulse interval to be unaffected (46·3 *v.* 55·0 min) but pulse amplitude to be increased (93·0 *v.* 47·3 ng/l). LH pulse interval was unaffected (71·5 *v.* 72·2 min) but pulse amplitude was decreased (1·54 *v.* 2·44 μg/l). It is concluded that hypoglycaemia causes increased β-endorphin release mainly by an effect on pulse amplitude. Hypoglycaemia also reduced LH pulse amplitude and may be part of the mechanism whereby undernutrition and low blood glucose adversely affect reproductive function. Although β-endorphin and other opioid peptides are known to inhibit LH release centrally, the significance of the increased plasma β-endorphin is unclear.

94. Influence of urea treatment of straw and of type of protein supplement on the milk production of cows fed maize silage and straw

T. Sylvester and J. D. Leaver, *Wye College, University of London, Wye, Ashford, Kent TN25 5AH*

The objective was to examine different nitrogen (N) supplementation sources on the milk production, diet digestibility and degradability of maize silage/wheat straw diets. Fourteen Holstein Friesian cows in a change-over design were offered 6 kg dry matter (DM) per day of maize silage and either untreated straw (US) (T_1, T_2, T_3) or straw treated with 50 g/kg urea (UTS) (T_4, T_5, T_6) offered *ad libitum*. The isonitrogenous supplements of 7 kg/day concentrate DM contained urea (T_1, T_4), soya-bean meal (T_2, T_5) or fish meal (T_3, T_6). Treatment T_7 was maize silage *ad libitum* plus the soya-bean concentrate. Mean milk yields (kg/day), fat (g/kg), protein (g/kg) and straw DM intakes were respectively, for US and UTS: 14·3, 14·1 (s.e.d. 0·29, $P > 0·05$); 43·9, 47·4 (s.e.d. 0·69, $P > 0·05$); 34·6, 35·1 (s.e.d. 0·24, $P > 0·05$); 3·3, 3·8 (s.e.d. 0·17, $P < 0·01$); and for urea, soya-bean and fish-meal supplements: 13·6, 14·1, 14·9 (s.e.d. 0·36, $P < 0·01$); 45·7, 45·9, 45·4 (s.e.d. 0·84, $P > 0·05$); 34·5, 35·3, 34·6 (s.e.d. 0·29, $P > 0·05$); 3·2, 3·6, 3·8 (s.e.d. 0·21, $P < 0·05$). For T_7 respective results were 17·2, 46·5, 36·3, 0; and maize silage DM intake 12·9 kg/day. A digestibility trial was carried out with growing heifers (420 kg live weight) offered diets T_1, T_3, T_4 and T_6 in a 4 × 4 Latin square with the same ingredient ratios. Respective total DM intakes (kg/day) were 9·8, 10·2, 10·9, 11·1 (s.e.d. 0·32, $P < 0·05$) and digestible organic matter in the DM were 657, 651, 672, 665 g/kg (s.e.d. 4·0, $P < 0·01$). Two rumen fistulated steers were used to measure food degradability. Effective degradabilities of DM and N respectively were for US 0·25, 0·27; UTS 0·36, 0·77; soya-bean meal 0·75, 0·74; fish meal 0·47, 0·66. Replacing maize silage with either straw severely depressed milk production, urea treatment increased DM degradability and straw intake. Protein source in the supplement significantly affected milk production and straw intake.

95. The effects of feeding a polymer gel to dairy cows in early lactation

P. C. Garnsworthy, *University of Nottingham, Faculty of Agricultural and Food Sciences, Sutton Bonington Campus, Loughborough LE12 5RD*

An experiment was conducted to investigate the effects of feeding a polymer gel to dairy cows in early lactation. Twenty-seven Friesian/Holstein cows were given daily 10 kg hay, 2 kg sugar-beet pulp, 2 kg grass nuts and 8 kg cereal-based concentrate (metabolizable energy 12·5 MJ/kg, crude protein 182 g/kg) for the first 3 weeks of lactation, when they were divided into three groups of nine according to milk yield and live weight. The concentrate allowance for group A was then increased to 10 kg/day and remained at 8 kg/day for groups B and C; the rest of the diet was unchanged. Group C were given a polyacrylate gel (2 l/day), which had been mixed at the rate of 10 g polymer per l water. Mean performance of cows in the three groups over weeks 3 to 14 of lactation is shown in the following table (peak yield is maximum yield during the experiment).

	A	B	C	s.e.d.
Peak milk yield (kg/day)	32·4	28·6	33·2	1·83*
Milk yield (kg/day)	29·4	28·0	29·9	1·02
Milk fat (g/kg)	51·2	50·9	51·4	2·14
Milk protein (g/kg)	32·9	33·0	32·8	0·46
Live-weight loss (kg)	28	38	13	8·7*

The gel has no intrinsic nutritive value but *in vitro* studies have suggested that it acts as a culture medium for bacteria in the rumen, thus increasing their mean residence time and number. Electron microscope studies indicate that this is probably limited to *Fibrobacter succinogenes*, a cellulolytic bacterium. Such a mode of action is consistent with the findings of this experiment and it is concluded that cows given a polymer gel produce as much milk as those given 2 kg/day more concentrates and lose less weight in early lactation.

96. Whole crop barley as a supplementary food for dairy cows grazing at two sward heights

A. Hargreaves and J. D. Leaver, *Wye College, University of London, Wye, Ashford, Kent TN25 5AH*

The objective was to examine the effect of herbage availability on the response to whole crop barley silage (WCB) in the July to September period. Winter barley (var. Puffin) was harvested on 16 July at 380 g dry matter (DM) per kg and a yield of 14 t DM per ha. In a 12-week grazing trial, four groups of three Holstein Friesian cows were allocated to a Latin-square design with the following treatments: T_1 and T_2 had low sward heights (3 to 5 cm) and T_3 and T_4 had high sward heights (6 to 8 cm). Treatments T_1 and T_3 has access individually to *ad libitum* WCB for 1 h after morning milking. All cows received 1·3 kg DM per day of soya-bean meal. Mean WCB intakes for T_1 and T_3 respectively were 3·5, 3·0 kg DM per day (s.e.d. 0·20, $P < 0·05$). For T_1, T_2, T_3, T_4 respectively, mean estimated (indirectly from individual energy requirements) herbage DM intakes were 11·8, 14·9, 14·0, 17·5 (s.e.d. 1·52) kg/day ($P < 0·001$); milk yields 16·2, 15·5, 16·8, 17·1 (s.e.d. 0·44) kg/day ($P < 0·01$); fat content 40·6, 42·0, 41·2, 40·4 (s.e.d. 1·51) g/kg ($P > 0·05$); protein 32·1, 33·8, 32·2, 32·3 (s.e.d. 0·85) g/kg ($P > 0·05$); grazing time 513, 633, 466, 570 (s.e.d. 17·8) min/day ($P < 0·001$); herbage intake rate 23·3, 23·7, 29·6, 30·9 (s.e.d. 2·88) g DM per min) ($P < 0·01$). In a digestibility trial with growing heifers digestibility of WCB (mean digestible organic matter in the DM 515 g/kg) was not significantly affected by supplementation with soya-bean meal, nor by level of feeding. Using two rumen fistulated steers, effective degradabilities of DM, N and starch in WCB were estimated to be 314, 459 and 371 g/kg respectively.