

THE EFFECT OF MELATONIN ADMINISTERED TO PREGNANT EWES
ON BROWN FAT DEPOSITION IN THE FOETUS

MARX A. BROCKHUS* JOHN M OBST* LEO J. CUMMINS* and LINTON D. STAPLES**

Brown adipose tissue (BAT) is a major contributor to heat production in the lamb, by way of non-shivering thermogenesis, and an important source of lipid (Alexander and Williams 1963). Exogenously administered melatonin has been shown to increase BAT weight in hamsters during both long and short photoperiods (Heldmaier and Hoffman 1974). Melatonin can cross from mother to foetus (Kennaway 1978) so the potential exists for increasing BAT levels in the newborn lamb and possibly improving lamb viability. This paper presents the results of an investigation into the effect of melatonin administered during gestation on brown fat deposition and lipid content in the foetus.

Forty-eight pregnant comeback ewes (synchronised and single foetuses) were divided into two groups (treated with melatonin and control). At day 56 (+3) of gestation ewes received a subcutaneous implant containing melatonin (Regalin; Genelink Aust) which maintained daylight plasma melatonin levels at about 1000 pM for approx. 10 weeks. Eight ewes from each group were then slaughtered at days 84 (+3), 112 (+3) and 140 (+3) of gestation and the foetuses removed. Measurements were made on BAT (perirenal-abdominal and pericardial), expressed as g/kg body weight, liver weight and humerus length. The entire lamb as well as the dissected BAT (pooled/group), was minced and the lipid contents determined. Table 1 shows a summary of the results.

Table 1 Humerus length (HL), BAT weight, liver weight (LW), foetal weight (FW), lipid contents (whole body and BAT) of foetuses retrieved at 3 ages from 2 treatments

Treatment	Age (days)	HL (mm)	BAT wt (g/kg)	Liver wt (g)	FW (g)	Lipid content (% fat) whole body BAT
Melatonin	84	32 a	4.16 a	19.2 a	409 a	3.90 a 43.9 a
	112	57 b	9.35 b	74.1 b	1521 b	8.16 b 77.5 b
	140	33 c	7.63 c	118.8 c	4307 c	8.59 b 73.1 b
Control	84	31 a	4.31 a	13.8 a	369 a	4.49 a 35.1 a
	112	62 b	10.28 b	90.7 b	1377 b	8.99 b 73.2 b
	140	89 c	3.26 c	133.1 c	4741 c	8.43 b 73.3 b
LSD		6	1.56	24.0	536	1.32

Different letters (within columns) indicate a significant difference ($p < 0.05$) (Analysed by ANOVA)

The amount of BAT (g/kg) and lipid (% fat) increased rapidly with age between 34 and 112 days gestation. In late pregnancy (112-140 days) the amount of lipid present remained constant while the amount of BAT declined ($p < 0.05$). This is in agreement with earlier data from Alexander (1978). Melatonin treatment had no significant effect on BAT and lipid content, nor on the other parameters measured.

ALEXANDER, G. and WILLIAMS D. (1958). *J. Physiol.* (London) 198: 251.

ALEXANDER, G. (1978). *Aust. J. Biol. Sci.* 31: 489.

HELDMAIER, G. and HOFFMANN, K. (1974). *Nature* 247: 224.

KENNAWAY, D.J. (1978). Ph.D. Thesis, Univ. of Adelaide.

* Pastoral Research Institute, P.O. Box 130, Hamilton, Vic., 3300

**Regulin Ltd., 222 Kingsway, Stn. Melbourne, Vic., 3205.