

HEAT STRESS DURING MID-PREGNANCY IN SHEEP RETARDS FETAL GROWTH BY RESTRICTING PLACENTAL GROWTH

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Chronic heat stress during pregnancy in sheep retards fetal and placental growth (Alexander and Williams 1971). Reduced fetal growth during late pregnancy may be a consequence of the primary inhibition of placental growth and functional capacity, or caused directly by a reduction in uterine blood flow. The objective of this experiment was to determine whether restricted placental growth contributes to fetal growth retardation resulting from chronic heat stress during mid-pregnancy.

The oestrous cycles of Peppin strain Merino ewes ($n = 21$) were synchronized and the day of mating recorded. Ewes grazed pasture as 1 flock until the 25th day of pregnancy when they were housed. Ewes were randomly allocated to 1 of 2 groups with a similar range in liveweight and condition score at the time of mating. Each group was further divided into 2 subgroups to be slaughtered at the 80th and 140th day of pregnancy. Control (C) ewes were housed in a naturally ventilated room until the 80th day of pregnancy where the ambient temperature was between 20° and 27°C. Heat treated (HT) ewes were housed in the temperature controlled room which was maintained at or above 42°C between 0800 and 1700 hours (9 h) and 32°C between 1700 and 0800 hours (15 h), between the 30th and 80th day of pregnancy. On the 81st day of pregnancy the remaining ewes were housed in the temperature controlled room which was maintained between 21 ° and 28°C until the 140th day of pregnancy.

Rectal temperature (mean $\pm$ s.e.) at 0800 and 1630 hours, between the 30th and 80th day of pregnancy, was $38.9 \pm 0.08^\circ\text{C}$ and $39.3 \pm 0.06^\circ\text{C}$ for C ewes and $39.2 \pm 0.09^\circ\text{C}$ and $39.7 \pm 0.12^\circ\text{C}$ for HT ewes respectively. Placental weight was lower ($P < 0.05$) in HT compared with C ewes at both the 80th (387 ± 53.7 g v. 546 ± 46.0 g) and 140th (230 ± 29.9 g v. 394 ± 35.5 g) day of pregnancy. Fetal weight of C ewes was not significantly different from HT ewes at the 80th day of pregnancy (255 ± 11.4 g v. 231 ± 9.8 g). Fetal weight of HT ewes at the 140th day of pregnancy was lower ($P < 0.01$) than their C counterparts (2.9 ± 0.14 kg v. 3.9 ± 0.18 kg). Placental weight measured at the 140th day of pregnancy was correlated with rectal temperature of ewes between the 30th and 80th day of pregnancy, measured at 0800 hours ($r = -0.67$; $P < 0.05$) and 1630 hours ($r = -0.62$; $P < 0.05$), but not with the increase in rectal temperature between 0800 and 1630 hours. Fetal weight measured at the 140th day of pregnancy was correlated with rectal temperature of ewes measured between the 30th and 80th day of pregnancy at 0800 hours ($r = -0.72$; $P < 0.05$) and 1630 hours ($r = -0.73$; $P < 0.05$), but not with the increase in rectal temperature between 0800 and 1630 hours.

It is concluded that heat stress in sheep during mid-pregnancy retards placental growth, which in turn limits fetal growth during late pregnancy, in the absence of heat stress. Rectal temperature at 0800 hours may be equally useful as rectal temperature at 1630 hours (Hopkins *et al.* 1980) as a selection criterion for ewes able to acclimatise to a hot environment and maintain normal conceptus growth during periods of chronic heat stress.

ALEXANDER, G. and WILLIAMS, D. (1971). *J. Agric. Sci., Camb.* 76: 53-72.

HOPKINS, P. S., NOLAN, C. J. and PEPPER, P. M. (1980). *Aust. J. Agric. Res.* 31: 763-7 1.