Ewe nutrition during pregnancy:

Effects on the development of twin fetuses

A thesis presented in partial fulfilment of the requirements for the degree of

Master of AgriScience in Agriculture

At Massey University, Palmerston North

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ABSTRACT

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This study set out to investigate the effects of dam nutrition during pregnancy on the anatomical development of twin fetuses, with particular focus on the fetal mammary gland. Ewes were fed at 3 different levels in early pregnancy (day 21 to 50, Low (L_{D21-50}) vs. Medium (M_{D21-50}) vs. High (H_{D21-50})) and 2 different levels in mid- to late-pregnancy (day 50 to 140, Medium ($M_{D50-140}$) vs. High ($H_{D50-140}$)). At D140, 58 twin-bearing ewes were euthanised, and dam and fetal organs were collected and weighed.

H_{D21-50} ewes were heavier than L_{D21-50} and M_{D21-50} ewes at D50. At D140, $H_{D50-140}$ ewes were heavier, in better condition score and gained more weight than $M_{D50-140}$. Ewe nutrition in either period had no effect on the total placental membranes weight, gravid uterus weight, total placentome number or their level of eversion at D140. Nutritional treatments in both early and mid- to late-pregnancy failed to affect fetal weight or general size measurements (crown-rump length, girth circumference, femur or fore-leg length). The *semitendinosus* muscles from L_{D21-50}-$H_{D50-140}$ fetuses were heavier than L_{D21-50}-$M_{D50-140}$ and H_{D21-50}-$H_{D50-140}$ after adjustment for fetal weight. Fetuses from L_{D21-50} dams had lighter mammary glands compared to the M_{D21-50} and H_{D21-50} fetuses, and these differences remained after adjustment for fetal weight. Maternal nutrition affected other organs and glands, including thyroids, liver, brain and ovaries.

The results indicate a critical window of early mammary gland development between days 21 to 50 of gestation, as the fetal mammary glands for the group restricted in early gestation remained lighter, independent of fetal weight or size. A larger cohort of these animals has been kept to monitor their lifetime performance. This work has the potential to change current farming practices and possible review of the fundamentals of human nutrition and health.

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