Weight changes and progesterone levels in ewe hoggets with foetal loss

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Introduction

Foetal losses in maiden ewes (ewe hoggets or two-tooth ewes), identified during pregnancy scanning, have been reported in New Zealand since the late 1990s. Significant losses on individual farms (greater than about 5% of the mob) would appear uncommon, but some farmers can have substantial losses. This is a frustrating problem for farmers and veterinarians - in the majority of cases no infectious cause is identified and the causes are largely unknown (reviewed by Ridler 2015).

In a case study on a commercial farm Ridler et al. (2015), found increased levels of foetal loss in hoggets that were small at mating or who had poor weight gain in early pregnancy. However this study only took place on one farm and it is unknown whether the result would be repeatable on other farms. It has been theorised that foetal loss in hoggets could be due to the development of an inadequate corpus luteum (CL) leading to insufficient progesterone production in early gestation and subsequently failure to maintain pregnancy. However this has not been investigated.

The aims of this study were to investigate associations between liveweight and foetal loss and to investigate progesterone levels in early and mid-gestation from affected and unaffected hoggets.

Methods

The study used approximately 500 ewe hoggets from each of two commercial North Island farms (Farms A and B). Both farms had experienced foetal loss in their hoggets in the previous year. Prior to mating the hoggets were tagged with an electronic tag, weighed and body condition scored (BCS). The breeding rams were fitted with mating harnesses and the crayon colour was changed every three days for the first nine (Farm B) or 12 (Farm A) days of mating. The colour was also changed on Day 17 at the end of the first cycle. Mating took place over two cycles (34 days), at the end of which the tup mark was recorded for each hogget. This was to give an indication of the approximate conception date for each hogget mated in the first 9-12 days.

Pregnancy scanning took place on three occasions: an early scan (Scan 1) at 22-56 days gestation, a scan at the usual time (Scan 2) at 47-86 days gestation and a late scan (Scan 3) at 75-110 days gestation. Reproductive performance for each hogget was recorded as non-pregnant, single or multiples. Ewe hoggets that were pregnant at one pregnancy scan but not at the subsequent scan, or had evidence of non-viable foetus/s (degenerated and/or no heartbeat) during scanning, were recorded as having foetal loss.

At the same time as pregnancy scanning all hoggets were weighed and body condition scored. A conceptus-free liveweight was
calculated for each hogget at each weighing event.

All hoggets that were only mated from Days 0-12 (Farm A) or 0-9 (Farm B) were blood sampled at Scan 1 and Scan 2. The samples were frozen and retrospectively tested for progesterone as follows: Samples from all hoggets that had a foetal loss were tested. For each affected hogget, a matched control was selected on the basis of being from the same farm, having the same tup mark, same mating weight and same foetal number. Samples from matched controls were also tested for progesterone.

On both farms the hoggets were fully vaccinated with 5-in-1 Clostridial vaccine and against Toxoplasma and Campylobacter. They were on a regular (28-day) preventative drenching programme through to late autumn and had an adequate flystrike control programme. On each farm the study group was managed as one mob under normal farm management for that property.

Results

Four hundred and seventy two hoggets from Farm A were pregnant at Scan 1 and 378 from Farm B, giving a total of 850 pregnant hoggets. A total of 69 hoggets subsequently had foetal loss (8.1%). There were 55 losses from Farm A (11.7%) and 14 losses from Farm B (3.7%).

On Farm A there was a difference in foetal loss depending on mating date; those that got pregnant in the first cycle were less likely to have foetal loss compared with those that got pregnant in the second cycle (7% vs 17%). This was unfortunate as it meant that most of the foetal losses on this farm were from hoggets that were not in the blood-sampled group. The same was not seen on Farm B, however there were only 14 foetal losses on Farm B.

On both farms the hoggets that had a foetal loss seen at Scan 2 had poorer weight gain in the month prior compared with those that maintained pregnancy. On Farm A this was also seen in hoggets that had a foetal loss at Scan 3. There was no association between foetal loss and any of the other parameters measured (BCS at any time, foetal number, Scan 1 weight or weight change from mating to Scan 1).

Only 16 out of 407 ewe lambs that were blood sampled had foetal loss (3.9%). Samples collected from these at Scan 1 and Scan 2 were retrospectively tested for progesterone levels in addition to those from 16 matched controls with no differences found.

Discussion

The hoggets that had a foetal loss had a significantly lower bodyweight gain in the month prior compared with those that maintained pregnancy (note these weights were corrected for conceptus weight). This was consistent for both farms and regardless of the gestational stage at which the foetal loss occurred. It is not clear why this occurred: did the foetal loss cause the hoggets to have a systemic reaction/feel sick and so their weight gain was reduced, or did they have something else wrong with them that caused a growth check and this triggered the foetal loss? On each farm all hoggets were managed in the same way and had the same animal health inputs.
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Progesterone levels in early gestation and mid-gestation were the same for affected hoggets as matched controls and were above that considered necessary to maintain pregnancy. Hence the theory that foetal loss in hoggets may be due to inadequate CL development and progesterone production is unlikely.

As with many hogget foetal loss studies, this study has raised as many questions as it has answered. However it would appear to rule-out the theory that low progesterone levels are an important cause of foetal loss in hoggets. Further investigation is required regarding the finding of weight gain differences between those that had foetal loss compared with those that didn’t.

Further work planned

Serum samples collected in early and mid-gestation from ewe hoggets that subsequently experienced foetal loss, and from matched controls, were collected in such a way that metabolomics testing can be undertaken.

Metabolomics has been defined as the “systematic study of the unique chemical fingerprints that specific cellular processes leave behind” (Daviss 2005). It is a relatively new field of science whereby a range of techniques are used to identify the levels of hundreds or thousands of metabolites, which are the low molecular-weight end products of cellular processes. Comparison of case and matched control samples may potentially show differences between groups in levels for some metabolites. If these can be matched to the cellular process(es) that created them then it may provide some clues as to what was happening in the affected sheep at the time the samples were taken.

Currently NMR (Nuclear Magnetic Resonance) spectroscopy is being undertaken on the samples (affected and two matched controls for each). Other detection methods are prohibitively expensive if undertaken at external laboratories; however Massey University aims to have the appropriate equipment for other methods later in 2016 which are considered more sensitive than NMR. In time the stored samples will be tested in this way.

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For formatting purposes, all original long URLs have been condensed using the bit.ly format.

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