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Periparturient relaxation of immunity to sheep worms: untangling immunological and endocrine associations

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During late gestation and lactation the periparturient ewe experiences a temporary breakdown of immunity to gastrointestinal nematodes. This relaxation of immunity manifests itself in a characteristic increase in faecal worm egg count, termed the periparturient rise (PPR). Periparturient ewes therefore become a potent source of pasture infection and subsequently expose young grazing lambs to nematode infection ultimately affecting the production and profitability of both ewes and lambs. Although modulators of the PPR have been identified (i.e. protein supply, genetic selection), targeted management has been hindered because the definitive causal factors are still unknown. To characterise associations among parasitological, immunological, endocrine and production responses of ewes during the PPR, we conducted a field experiment using a factorial design with 3 replicates per treatment combination. The main effects were pregnancy status (dry or single-bearing), infection status (nil or 6,000 *T. colubriformis* L₃/week), and, within single-bearing ewes, lactation status (lambs weaned at 2–3 days of age or lambs allowed to continue suckling). In terms of the cost to the ewe, suckling a lamb resulted in lower fat and eye muscle depth at the C site signaling mobilization of fat and protein reserves. Circulating eosinophil count in the suckled group was depressed compared to the early weaned group (0.15 vs 0.55 × 10³ cells/μL) illustrating a loss of immunity. Suckled ewes also exhibited significantly higher prolactin levels but significantly lower leptin and cortisol levels than their early-weaned counterparts. These are hormones that are indicative of nutritional state. The PPR was first observed 2 weeks prior to the midpoint of lambing (Fig. 1) and by 6 weeks post-lambing, the worm egg count of suckled ewes was almost 8-fold that of early weaned ewes (2074 and 266 eggs per gram faeces, respectively). Similarly, intestinal worm counts of suckled ewes were more than 6.5-fold that of weaned ewes by 6 weeks post lambing (14,067 vs 2117 adult *T. colubriformis*).

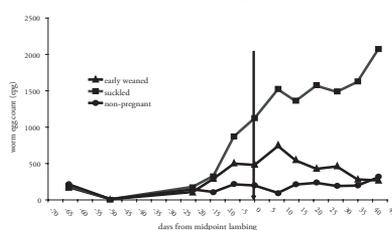


Fig. 1. Faecal worm egg count of infected early-weaned, suckled and non-pregnant ewes from 7 weeks pre to 6 weeks post-lambing. Solid line represents midpoint lambing and shaded area represents the lambing spread.

This experiment has confirmed lactation to be a major contributor to the PPR. The higher worm egg count and worm burdens during lactation were associated with lower circulating eosinophil and cortisol and leptin concentration. These results suggest that mobilisation of muscle and fat tissue as a consequence of lactation is the primary causal factor for changes in immune and endocrine status associated with the PPR.