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Milk production and plasma prolactin levels in spring- and autumn-lambing ewes

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INTRODUCTION

Ovine prolactin (oPrl) is essential to normal lactogenesis in ewes. Abolition of oPrl secretion during late pregnancy using bromoergocriptine reduces subsequent milk yields (MY) (Kann, 1976; Hooley *et al.*, 1978). Plasma oPrl levels in dry ewes are primarily determined by photoperiod, reaching minimal levels in autumn, remaining low throughout winter and spring and rising to peak in summer (Munro *et al.*, 1980). In pregnant ewes this pattern is interrupted by a peak at parturition. Level of nutrition is not expected to affect oPrl levels in pregnant ewes since marked underfeeding or ad libitum feeding did not affect oPrl levels in ovariectomized ewe lambs (Foster *et al.*, 1989). High endophyte levels in pasture depressed oPrl levels in grazing sheep (Fletcher and Barrell, 1984) and may contribute to lower autumn MY. Other dietary factors may also affect oPrl levels. The trials described here were designed to determine whether autumn-lambing (AL) ewes have lower MY than spring-lambing (SL) ewes and if this is associated with lower autumn oPrl levels or dietary differences.

MATERIALS AND METHODS

In trial 1 (1987-88) MY was measured in 9 August-lambing (5 single, 4 twin) and 8 April-lambing (4 single, 4 twin) housed Border Leicester x Romney ewes fed cut pasture (67%) and hay (33%) to individual ME requirements from 21d prepartum. Photoperiod was set at 18:6 and plasma was collected by venipuncture 3 times daily at 5d intervals from 21 days prepartum and mean daily oPrl levels calculated. MY was measured on the first 8 days of lactation after a 6 hr (approx) separation from lambs when ewes were milked using oxytocin (1-2 i.u.), a milking machine and hand stripping. In trial 2 (1989-90) 10 August-lambing (7 single, 3 twin) and 10 April-lambing (7 single, 3 twin) ewes were used. This trial differed from trial 1 in that ewes were fed chaffed meadow hay (50%) and sheep nuts (50%) from the same batches in both seasons. One plasma sample was collected on each sampling day and lamb growth was recorded weekly.

RESULTS

In trial 1 SL ewes had higher ($P<0.01$) mean daily MY (2082 ± 133 g) than AL ewes (1732 ± 92 g) over the first week of lactation (Figure 1).

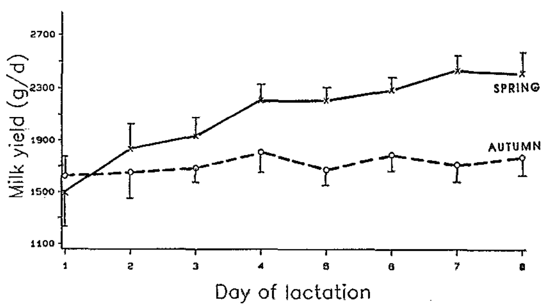

FIG 1 Trial 1: Comparison of spring and autumn milk yields in ewes fed fresh pasture and hay.

On day 7 SL ewes produced 42% more than AL ewes (2456 ± 125 g vs 1736 ± 113 g). SL ewes had higher ($P<0.01$) oPrl levels over the sampling period (Figure 2).

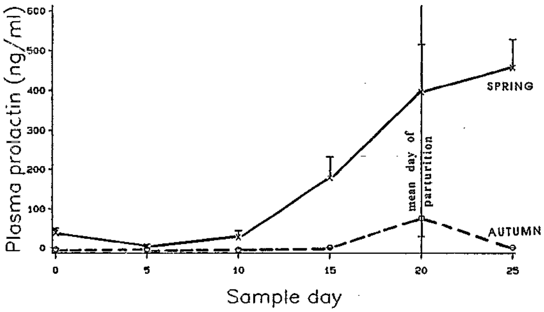

FIG 2 Trial 1: Comparison of spring and autumn plasma prolactin levels in ewes fed fresh pasture and hay.

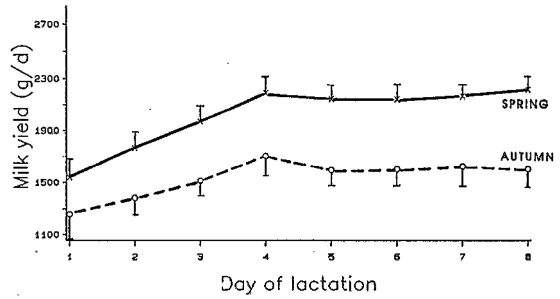

FIG 3 Trial 2: Comparison of spring and autumn milk yields in ewes fed the same diet in both seasons.

Mean plasma oPrl levels at parturition were 405 ± 117 and 85 ± 50 ng/ml in SL and AL ewes respectively. Mean postpartum liveweights (PPLWT) did not differ between SL (60.4 ± 1.2 kg) and AL (62.1 ± 5.9 kg) ewes. Lamb birthweights were higher (P=0.07) in spring (4.47 ± 0.23 kg) than in autumn (3.80 ± 0.28 kg) and lamb growth rates over the first week were higher (P=0.05) in spring (227 ± 18 g/d) than in autumn (184 ± 13 g/d) resulting in spring lambs being 1.00 kg heavier (P<0.001) at 7 days than autumn lambs.

In trial 2 SL ewes again had higher (P=0.001) mean daily MY (2013 ± 119 g) than AL ewes (1553 ± 108 g) over the first week (Figure 3).

On day 7 SL ewes produced 33% more than AL ewes (2189 ± 104 g vs 1651 ± 135 g). SL ewes also had higher (P<0.01) oPrl levels over the 25d period (Figure 4.).

Mean oPrl levels 3 days prepartum were 312 ± 85 ng/ml and 152 ± 57 ng/ml in SL and AL ewes respectively. However, due to summer pasture shortages, the mean PPLWT of SL ewes (62.2 ± 1.68 kg) was higher (P<0.001) than that of AL ewes (52.9 ± 1.07 kg). Over the trial period SL ewes had a higher mean energy deficit (difference between ME requirement and ME intake) (106 ± 19 MJME) than AL ewes (73 ± 9 MJME) (P<0.01). Mean spring (4.34 ± 0.25 kg) and autumn (3.76 ± 0.34 kg) birthweights did not differ significantly but spring lambs grew faster (284 ± 15 g/d) than autumn lambs (206 ± 22 g/d) to age 28 d (P<0.001).

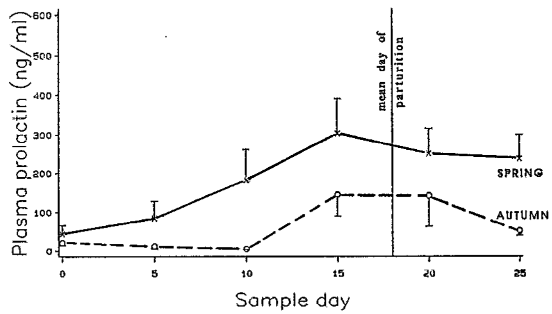

FIG 4 Trial 2: Comparison of spring and autumn plasma prolactin levels in ewes fed the same diet in both seasons.

DISCUSSION

The lower MY and oPrl levels in AL ewes in both trials suggest that the reduced MY and lamb growth rates are associated with lower oPrl rather than dietary differences. However, the confounding effect of PPLWT differences in trial 2 prevents clear conclusions being reached regarding the cause of reduced MY. Current trials in which supplementary oPrl is administered to AL ewes may confirm a causal relationship between oPrl levels and MY. Lower growth rates in autumn lambs have been reported by Cruickshank and Smith (1989) and may be influenced by factors, in addition to milk yield, such as lamb prenatal and noenatal oPrl levels which also respond to prenatal photoperiod

(Bassett *et al.*, 1988; Ebling *et al.*, 1989). Further work is required to establish causal relationships among oPrl levels, milk yields, birthweights and lamb growth.

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