Effect of time of treatment and selection for out-of-season breeding on the superovulatory response in ewes

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INTRODUCTION

Previous results (Greaney, *et al.,* 1991.) indicate that season of year has little effect on the response parameters of MOET although interactions between breed and season were recorded. Flocks within a breed have been selected for differences in seasonal lambing patterns based on ewe lambing date (Smith, *et al.,* 1992). This trial reports the effects of this selection on the production and quality of embryos following superovulation at two times of the year as part of the cryogenic conservation process for these flocks.

METHOD

Thirty ewes, from each of the Ruakura early lambing (BV neg) and later lambing (BV pos) selection lines were selected on basis of BV value (neg = -0.57 ± 0.03 vs pos = +0.32 ± 0.02 units) and subjected to FSH superovulation treatments (Thompson, *et al.,* 1992) in either Feb-March (Early) or mid-May (Late). The ewes were hand-mated with rams from the same selection lines and then 6 days later flushed for embryos. The number of ovulations, eggs recovered and eggs fertilised were recorded.

RESULTS

There was a significant effect of date of treatment ($P<0.001$) on interval from CIDR removal to oestrus and a date x BV interaction (Early-neg =16.9 ± 0.3 h, Early-pos =18.3 ± 0.4 h, Late-neg =34.1 ± 1.4 h, Late-pos =28.6 ± 1.3 h; $P<0.001$).There were also significant effects of date and BV on ovulation rate (neg = 8.73 ± 1.08 vs pos = 6.62 ± 1.08; $P<0.05$, and Early = 9.63 ± 0.92 vs Late = 6.00 ±0.56; $P<0.001$). There was no significant interaction, although the seasonal difference was largest in the BV negative group (neg = -5.53 vs pos = -3.20). Egg recovery rate was effected by BV and date (neg = 73.3 ± 7.6 % vs pos = 54.1 ± 7.6 %; $P<0.01$; Early = 58.9 ± 5.0 % vs Late = 69.2 ± 5.0 %; $P<0.05$). Fertilisation rate (eggs fertilised of eggs recovered) was influenced by date(Early = 43.0 ± 12.8 % vs Late = 81.1 ± 12.8 %) but not by BV class (neg = 64.3 ± 8.1 % vs pos = 64.4 ± 8.1 %; ns). Ram fertility (ewes with fertilised eggs of ewes mated) ranged from 33 % to 93 % and the fertilisation rate ranged from 39 % to 84 % for individual rams. There was no consistent date of treatment effect on individual rams.

Ewe liveweight was not influenced by BV but there was an effect of treatment date (Early = 64.0 ± 1.2 kg vs Late = 59.6 ± 1.1 kg; $P<0.05$). There were no significant correlations between ewe-weight and the response parameters either within sub-groups or overall. The average number of fertilised eggs per ewe per treatment was 2.50 with the BV neg ewes responding better than BV pos ewes (3.08 ± 0.58 vs 1.93 ± 0.58; $P<0.05$) due to a higher ovulation rate and egg recovery. The date effect was less pronounced (Early = 2.12 ± 0.40 vs Late = 2.81 ± 0.40; $P<0.1$) with the higher fertilisation rate in May being cancelled out by the lower ovulation rate in that month.

DISCUSSION AND CONCLUSION

These results show that both ewe genotype and date of treatment effects the success of MOET programmes. The effect of date on the interval from CIDR removal to oestrus is unexpected as previous data (Smith, *et al.,* 1991) suggests that the later date should have the shorter interval. The decline in ovulation rate with time is also contrary to that expected from known seasonal effects but could in part be explained by the loss in liveweight over the period, although others (Greaney, *et al.,* 1991.) have reported a higher superovulation response out-of-season. The BV effect is opposite to that seen in unstimulated ewes where the 'positive' group has the higher fecundity (Smith, *et al.,* 1992). The importance of the liveweight loss must be questioned as none of the correlations were significant and both embryo recovery and fertilisation improved over time. This latter effect could be male related due to improvements in semen quantity and quality (Smith, *et al.,* 1997) which also supports the lack of BV effect. The lack of a BV effect on fertility dispels the idea that selection for a later date of lambing was in fact selecting for infertility. The animals selected for earlier lambing had higher numbers of fertilised eggs, as a result of higher ovulation and egg recovery rates. The physiological and endocrinological basis for this is unknown.

REFERENCES

Greaney, K.B. *et al.,* 1991. *Proceedings of the Animal Society of New Zealand* **51:** 129- 131.

Smith, J.F. *et al.,* 1992. *Proceedings of the Animal Society of New Zealand* **52:** 129-131.

Thompson, J.G. *et al.,* 1992 *Proceedings of the Animal Society of New Zealand* **52:** 171- 174.

Smith, J.F., *et al.,* 1991. *Proceedings of the Animal Society of New Zealand* **51:**117- 121.

Smith, J.F. *et al.,* 1997. *Proceedings of the Animal Society of New Zealand* **57:** (in press).