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## Effects of GnRH and of single versus multiple mating on the conception rate in alpacas

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### ABSTRACT

The effects of injecting GnRH at mating and of single vs multiple matings on the conception rate in alpacas were investigated in two experiments. In Experiment 1, 33 low liveweight ( $48.4 \pm 1.3$  kg) female alpacas were mated in autumn 1990 and 14 of them received an injection (im) of 1ml GnRH immediately after mating. There were no effects of the GnRH on conception rate but females which conceived were heavier than those that did not conceive ( $50.6 \pm 1.6$  kg vs  $46.1 \pm 1.8$  kg). Most female alpaca remained receptive to the male for at least 3 days in one oestrus period.

In Experiment 2, female alpacas were mated in autumn and spring 1991 with one group being mated once while the other group was exposed to males once or twice a day for 3 days. Conception rates were similar in the single (80% and 54% in autumn and spring) and multiple (73% and 43% autumn and spring) mated alpacas. There was no difference in duration of copulation between alpacas conceiving and not conceiving.

**Keywords** Alpaca, mating, GnRH, oestrus.

### INTRODUCTION

Alpacas arrived at Flock House in February 1990 after a period of 120 days quarantine in Chile and on Somes Island. The alpacas needed to be mated immediately despite having low live weights ( $48.4 \pm 1.3$  kg) and not having time to settle into their new environment. Alpacas are induced ovulators and failure to ovulate is a major cause of infertility in South America (Sumar 1985). Injection of HCG will induce ovulation in alpacas (Fernandez-Baca *et al.*, 1970) but it is not known if GnRH will also be effective. Ovulation in alpacas occur 24-26 hours after mating (San Martin *et al.*, 1968) but there appear to be no reports on how long the female alpaca remains in oestrus after first mating. It is also unclear if remating closer to the time of ovulation, as would occur in multiple mating, will improve conception rates.

The first experiment in this paper investigates the use of GnRH injection at mating on conception rates in low liveweight alpacas while the second experiment compares conception rates following single and multiple mating of female alpacas.

### MATERIALS AND METHODS

#### Experiment 1

On 12 March 1990, 33 female alpacas were randomly divided into two groups. One group was injected (im) with 1ml GnRH (Receptal: Hoechst Veterinarar) immediately after first mating. The other control group received no GnRH. Each female was placed in a pen with a male and females not taking up the mating position within two minutes were considered not to be in oestrus. The female alpacas were exposed to the males for mating each day for 3 to 5 days. Pregnancy diagnosis occurred at 91-113 days post-mating using realtime ultrasound with a transabdominal probe.

#### Experiment 2

On the morning of 18 March 1991 (Autumn) 26 mature female alpaca were weighed and then placed with one of four

mature male alpacas in four 10 x 24m paddocks. Each female mated was recorded together with the male's number and duration of mating and then remove from the paddock. Mated females were then randomly allocated to two groups. One group, the single sire group, had no further contact with males until 15 days later. The females in the other group, multiple mated group, were reintroduced to the same males in the afternoon and again each morning and afternoon for a further two days (ie. a total of 6 potential matings). This procedure was repeated each day until all the alpacas were mated.

On the 13 November 1991 (Spring) a similar procedure commenced with 19 female alpacas, but only two males were available for mating. The alpacas were weighed on 12 November.

Returns to service were determined by putting each female alpaca with a male 15-20 and 30-35 days after first mating. Real time ultrasound using transrectal and transabdominal probes were used at 35 to 60 days post mating to determine the pregnancy status in female alpacas that had not returned to the male.

### RESULTS

#### Experiment 1

On the first day of mating 71% of the female alpacas were receptive to the males. Considering only the 11 alpacas that had conceived and therefore had ovulated and which had a full set of mating data, 9 were mated on 3 of the 5 days and 2 on each of the 5 days. There was no difference in the conception rates of the alpacas receiving GnRH (50%; 7/14) and the controls (47%; 9/19). Alpacas which conceived were heavier ( $P < 0.10$ ) than those that did not conceive ( $50.6 \pm 1.6$  kg vs  $46.1 \pm 1.8$  kg).

#### Experiment 2

The mean  $\pm$  SEM weight of the alpacas mated in the autumn and spring were  $63.47 \pm 2.0$  kg and  $60.7 \pm 2.2$  kg respectively.

There were no significant differences in conception rates between single and multiple mated alpacas in either the autumn (80%; 12/15 vs 73%; 8/11) or spring (54%; 7/13 vs 43%; 3/7).

Conception rates were lower in spring (50%; 10/20) than in autumn (80%; 20/25) but the difference was not significant.

The average number of matings for the multiple mated alpacas was 3.4 (range 2 to 6) in autumn and 2.4 (range 2 to 3) in spring. An apparent lower libido of the 2 males in spring made it difficult to repeatedly mate the females with the same males. Although the mean duration of mating was shorter ( $P < 0.05$ ) in the autumn multiple mated group ( $9.8 \pm 0.8$  min) than in the single mated group ( $15.7 \pm 2.0$  min) the maximum duration of mating for the multiple mated females was similar ( $14.8 \pm 1.8$  min) to that of the single mated females. The first mating was the mating of maximum duration in only 3 of the 11 multiple mated alpacas in autumn. There were no differences in duration of mating for alpacas in the spring multiple ( $8.7 \pm 1.0$  min) and the single ( $9.6 \pm 0.7$  min) mated groups. There were no significant differences in duration of mating for the single mated alpaca which conceived and those that did not conceive ( $15.6 \pm 2.0$  min vs  $14.33 \pm 6.4$  min in autumn group and  $9.8 \pm 0.8$  min vs  $8.8 \pm 0.7$  min in spring group). There were no significant differences in autumn between the liveweight of alpacas conceiving ( $64.7 \pm 2.3$  kg) and those not conceiving ( $58.8 \pm 3.8$  kg). Similarly in spring there were no differences in liveweights ( $60.1 \pm 2.0$  kg for alpacas conceiving vs  $61.2 \pm 3.9$  kg for alpacas not conceiving).

#### DISCUSSION

Despite the low liveweight of the alpacas in autumn 1990, most of the females were in oestrus when the males were introduced and they remained receptive to the males for at least 3 days. Ovulation occurs 24-26 hours after mating (San Martin *et al.*, 1968) which means that oestrous behaviour was maintained for several days after ovulation of the larger follicle(s). Conception rates in this first breeding season in New Zealand were low and the injection of GnRH at mating did not improve the conception rates. The inability to laparoscope the females prevented us determining if failure to ovulate was a problem in these alpacas, and if GnRH induced ovulations. That the lower liveweight of the alpacas in autumn 1990 was part of the reason for the low conception rate is suggested by the higher mean liveweight of the alpacas which conceived in that breeding

season compared to the alpacas that did not conceive. These differences in liveweight were not apparent in subsequent breeding seasons when the alpacas were 12-15 kg heavier.

Conception rates to a single mating were as high as when female alpacas were mated repeatedly. Alpaca semen deposited in the female's reproductive tract must remain viable for at least 24 hours to ensure fertilisation. The results also support the work of Fernandez-Baca *et al.*, (1970) that a single mating was as good as multiple mating at stimulating female alpacas to ovulate. In a breeding programme, maximum use of a superior male can be made by hand mating him once with each female. This prevents the male exhausting his libido and semen by mating the same female repeatedly over the 3-5 days they are in oestrus.

The duration of copulation in both the autumn and spring matings were shorter than the  $21.9 \pm 1.2$  min reported by Fernandez-Baca *et al.*, (1970) but similar to the duration of mating reported by Pollard *et al.*, (1991) for paddock mated alpacas. The copulation of maximum duration was not always the first mating in the alpacas which were mated more than once. There was no relationship between the duration of copulation and conception rate which agrees with results reported by Fernandez-Baca *et al.*, (1970).

In conclusion the results indicate that injection of GnRH does not improve conception rates in low liveweight alpacas. Maximum use of males can be made by mating each female only once in the oestrous period.

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