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Approaches in developing a successful trans-cervical AI programme for farmed deer

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ABSTRACT

Trans-cervical artificial insemination (AI) in farmed deer has emerged as a highly successful reproductive tool that can rapidly increase rates of genetic gain in farmed deer. Conception rates in excess of 70% are confidently achieved if all aspects of a simple programming prescription are followed. Hind nutrition, attention to hygiene and reducing individual animal and herd stress levels appear to be key factors, over and above that of semen quality and insemination skills. Many factors cumulatively affect success or failure within the typical eight week breeding season. Combinations of care and attention to detail are essential. This paper considers the interplay of these factors in advising choices made that underpin a successful trans-cervical AI programme based on commercial experiences.

Keywords: red deer; artificial insemination; semen; genetics.

INTRODUCTION

The development of commercial trans-cervical AI services for the farmed deer industry has gained immensely from new approaches in technique and operator success over the past 4 years. The progression has been prompted by resistance to the high labour and technical inputs required for laparoscopic intrauterine AI programmes that were the hallmark of the early industry. Some farmers viewed the excellent results seen in some laparoscopic programmes as a worthy investment, given the high value placed on semen sources from the elite imported and home-bred sires that have their origin in the named great deer herds of the world. However, there was a growing resistance to such invasive techniques when semen prices decreased and quality sires became available at reasonable prices. Conception rates and weaning rates had progressed to a consistent 60% (Hunter 1997) with some herds in excess of 72 – 75% from laparoscopic AI. However, a typical programme was often restricted by time (9 – 15 hinds per hour), labour (6 – 10 people), expert veterinarian availability and the need for anaesthetic drug regimes, surgical manipulations and specialised equipment (cradles, laparoscopes, etc).

It was considered that the associated stresses and drug use for fixed-time laparoscopic insemination compromised success in using frozen semen for multiple ovulation and embryo recovery programmes. As the demand for embryo transfer (ET) escalated with the arrival of new genetic lines from overseas, further less invasive techniques were in demand and under development.

Early trans-cervical AI involved fixed-time inseminations via vaginal speculum with semen deposited at the os of the cervix, and more rarely inserted in the cervix. Various methods of oestrous detection (ferning and elasticity of mucous) and variation of timing in relation to intravaginal CIDR device removal in comparison to laparoscopic AI, all produced highly variable results. (Asher *et al.*, 1994; Hunter 1997) The cost value of semen also biased earlier experimentation in alternate techniques. Elk and larger elk-hybrids were, however, being inseminated trans-cervically by Canadian (Dr Martin Wenkoff) and NZ (Ian McDonald) expertise with some success. Techniques were advanced through Guelph University (Clare Plante, Dr Mike Bringans). During 1997 these efforts included red deer.

In NZ, expert beef and dairy technicians were encouraged, in association with Xcell Breeding Services and leading deer reproductive veterinarians, to extend their skills and their physical ability to manipulate the reproductive tract via rectum using the same methodology as for dairy and beef cattle industry (Rhodes and McDonald, 2002).

In 1998, the senior author, in association with Dr Ian Scott, successfully inseminated red deer and smaller hybrids and developed a major commercial programme for the following year. Technology changes included the use of a caprine flexi-tip on the end of the pistolette to ease manipulation of the semen through the cervix and into the body of the uterus via rectal manipulation.

These initial programmes covered 3 herds totaling 200 hinds, with results from 65% - 82% conception rate. This welcome success instigated an annual commitment of 5000 – 8000 hinds in all parts of NZ in a variety of programmes and dates from 1 March— 30 April, in the 2000- 2003 seasons.

Technique and general practicalities

In general terms, adaptation of cattle trans-cervical AI systems is straightforward and is a simple transition of technique from one species to another. The knowledge and skills of veterinarians and researchers, in understanding the cycle and the seasonal demands of deer, underpin an integration of a routine and simple programme for fixed-time insemination. The programme is applicable with only minor adjustments from one end of the breeding season to the other (i.e. 1 March – 30 April).

Experience suggests that the sum of many variables on each property all combine to affect results. No single component, with the possible exceptions of semen quality and technical expertise and reliability, will likely have a dominant critical effect. All variants in the technique are additive effects that reduce the potential for a 70%+ success rate.

However, red deer and elk do present significant additional physical challenges, even to the most

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experienced technicians.

- Red deer have a small pelvic opening and a small cervix, along with a narrow rectal passage. Small slender hands, care and extensive previous AI experience are critical.
- The cervix anatomy is complex, with 5 – 7 muscular rings and a convoluted lumen path (Fisher & Fennessy, 1985). However, these relax for manipulation close to the timing of oestrus.
- Farmers also have specific responsibilities. Good restraint systems are critical for the safety of the deer and the technician. To minimise the risk of internal damage the hind must be held comfortably with hips held high and naturally at the end of the cradle and the animal not able to move forward or collapse down. Shed dust should be kept to a minimum and overall facility cleanliness is important.
- The technician needs some freedom of movement around posts or walls at the end of the crush so that manipulation and shoulder movements are free and allow uninterrupted access to the assistant delivering the loaded pistolettes to the technician.
- Shed routine is important. Consistency in yarding, handling or grouping of deer and elimination of aggressive or exceptionally nervous animals are required. Such individuals disrupt group dynamics, delay programmes and compromise success. While such animals often conceive, it is argued that their greater effect on the group is an avoidable stress source. Gains of 10 – 15% are reported by selection for hinds that "cope" with considerable farmer intervention in these programmes.

Hind preparation – selection of AI recipients

It is recommended strongly that hinds should have their calves weaned and be on a rising plane of nutrition maintained through and following the programme until the end of back-up mating.

There are obvious seasonal variations in timing. March-based (early) programmes can be successful if CIDR programming is started at calf weaning. A balance is needed between early weaning and April programmes as there is a risk hinds can become too fat for ease of manipulation, with some suggestion also that fatter hinds appear not to respond to programming as well.

Hind body condition scores (BCS) of 3.0 – 3.5 are ideal, but there is some risk of rapid build-up of internal pelvic and kidney area fat deposits if animals are weaned for some weeks prior to AI and gaining condition rapidly, or especially if the hind has not reared a calf prior to the mating season.

In general the following points are useful for hind selection:

- No late calvers.
- Good conformation, frame size, pelvic width and weight.
- No dubious breeding background (e.g. history of calving difficulties).
- Animals that are relaxed and familiar with facilities and familiar herd grouping, (i.e. refrain from shifting the hinds immediately prior to or after the AI).
- No evidence of physical injury to hinds (i.e. concrete wear of hooves, transportation/shed injury, open wounds, abscesses etc).
- Hinds must be individually identified and easily recorded.
- It is recommended that only multiparous hinds are used. Yearling hinds have different seasonal patterns (Asher *et al.*, 1994) and are of questionable value at this point.
- Programme details and hygiene are critical.
- At AI time each hind is scored for individual response to the CIDR programme. A vaginal sheath is inserted to allow mucous flow viscosity and status to be assessed and recorded prior to insemination. Cervical dilation at AI is also recorded as important information, with the cumulative scores reflecting the programming response. Standard details of identity, condition and any other comments are also noted.

General results

Accurate analysis of results that may yield additional data on trends of success over a season is difficult in a commercial programme (Table 1), but the trends appear have been generally consistent.

TABLE 1: 2002 season conception rate results for Lynne Rhodes AI Services Ltd programme based on scanned pregnancy confirmation.

	Adults MA hinds	Yearlings	Elk/Elk Wapiti
Total Programmes	32	4	8
Number of hinds AI'd and reported scanned	2124	605	272
Conception rate via ultrasound	1560	226	185
Scan %	74.0	37.4	68.0

Totals: 44 programmes, 3001 inseminations, 1971 conceptions verified (65.7%)

The recommended best practice approach is relatively robust from start to finish of the season. Generally, little consistent impact across ± 4 hours variation in AI timing following removal of CIDR devices, age of recipient hind and across a variety of semen, both fresh and frozen, is seen. If semen exceeds a baseline quality (i.e. 30 x 10^6 sperm per inseminate at >60% motility at thawing), semen quality is not an issue. Professional semen processors have developed a minimum standards code for viable deer semen and quality is not now generally an issue (I. McDonald pers comm.).

However, range in conception rates achieved across farms is 20% - 100%, with an overall average at 74% in the 2001/2002 seasons. This average is a favourable comparison with typical industry beef/dairy AI results, and on par with good results for laparoscopic AI in cervids (60 - 70%) and reports of trans-cervical AI in elk (68%; Hunter 1997). In our commercial experience, the base rules in management of any AI programme determine the success rate at critical points and these are common features. Final results are combinations of critical aspects and profoundly influenced by the weakest link.

Recommendations for AI programming for red deer

- Weaning of calves is absolutely critical. This should be performed at least at insertion of CIDR devices if not before.

- Oestrous synchronization using CIDR devices requires time, care and cleanliness at both insertion and removal. Equipment should be cleaned, disinfected in a bath, hands washed and gloves changed frequently. Minimising trauma at removal is also important. Deer are often handled at unusual times of the day and there are new faces and activities in the shed, all of which add to stress on the animals.
- Accurate PMSG dose and particular care with storage, makeup of product and use are important. Following instructions is mandatory. Accurate injection sites in the neck area are advised. Needles should not be not plunged into whatever seems available. In our experience, the brands of PMSG available have some variability within the season and between brands.
- Two CIDR (type G) devices are used per hind (either 2 initially on day 0, or preferably with replacement at day 8 or 9, as long as the additional handling doesn't add to stress levels or hygiene issues) Single CIDR type B device is used for elk cows. PMSG is delivered at final device removal.
- Hinds should be on a consistent rising plane of nutrition.
- For AI timing, programmes that target 56 – 60 hours after CIDR device removal (note, elk at 60-64) seem to yield consistent results irrespective of the time of season. However, there is an increasing trend to program for 58 – 62h. Hinds should be grouped in 2-h run batches of 50 hinds per batch (30 elk cows).

Other factors to consider

- It is important to reduce stress on hinds throughout oestrous synchronisation and insemination. Avoid unnecessary yarding and maintain a rising plane of nutrition.
- Early season programmes (i.e. early March) certainly benefit from the relationship between early weaning and good nutrition. Optimum dates for high conception rates are in the first two weeks of April for red deer and last week of March for elk. Earlier AI requires sound nutritional/weaning management for success and have the added bonus of the earlier calving and back-up stag date (i.e. no late calves).
- Hinds should not be transported for programmes within 6 weeks pre-treatment and not put under any post-treatment stress for 4 weeks following insemination.
- Hind selection should be based on good breeding history. Culling of hinds due to unusual features, physical barriers or temperament response can also add to programme success.
- Competence of semen technologists at collection and freezing, and also at the handling during the AI procedure, are key components of success. In broad terms there seems little difference in results between fresh and frozen semen. However, some stags exhibit poor fertilization ability of their semen.
- Experience and competence (physical skills) of the AI technician appear absolutely crucial, especially in ensuring passage of AI equipment via cervix (i.e. not using excessive force in achieving the accurate deposition of semen in the uterus).
- Problems with hinds used in AI programmes should be recorded and these hinds should not be used in future programmes. While there is no accumulated data set, it seems logical to group the successful hinds for future programmes. Anecdotal reports from farmers who use only the successful conceivers in one year find value in following seasons (up to 20% improvement). Potential cull or rejection criteria include prolapse (rectum or vaginal support ligaments), urine pooling, infection, poor temperament, poor oestrous synchronisation response and internal bleeding.
- There is no requirement to fast hinds prior to insemination. Hind groups should be sorted at removal of CIDR devices (50 hinds per group) and sorted, if possible, on potential sire semen use. This aids the efficiency of semen preparation and recording, and efficiency of insemination. Animals shouldn't be held for long periods in the yards, but be allowed to come in and out in small and settled groups when needed for AI.
- There seems to be inconsistent results in using adjacent or vasectomised teaser stags as stimulants (Hunter 1997). Fence security is critical for AI mobs, and breeding stags should be kept well away following removal of CIDR devices.

CONCLUSIONS

All of the many variables must be considered and delivered to the highest degree of the requirements for the chance to obtain maximal results (70+%). Luck, good or bad, has nothing to do with success. Trans-cervical AI in deer offers a huge leap forward in terms of rapid genetic gain. It is simple technology that can provide consistently high results and a cost effective tool in modern deer farming.

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REFERENCES

Asher G.W.; Fisher, M.W.; McLeod, B.J.; Berg, D.K. 1994: Reproductive Physiology of Cervids: A review. *In: Proceedings of a deer course for veterinarians, no 11, Queenstown. Ed:* PR Wilson. Deer Branch of the NZ Veterinary Association: 257-

277.

Hunter, J.W. 1997: Current reproductive technology as applied to the NZ deer industry. In*: Proceedings of a deer course for veterinarians, no 14, Wairakei. Ed:* PR Wilson. Deer Branch of the NZ Veterinary Association.

Fisher, M.W.; Fennessy, P.F. 1985: Reproductive physiology of female red deer and wapiti. *In: Proceedings of a deer course for veterinarians, no 2, Ashburton. Ed*: PR Wilson. Deer Branch of the NZ Veterinary Association: 88-100.

Rhodes, L.; Mcdonald, I. 2002: Trans-cervical AI in Cervines. DEEResearch technical day, conference proceedings, NZDFA Conference, Wellington: 46-50.