Good results from AI in Fallow deer

A guide for farmers seeking genetic improvement through intrauterine insemination of their does

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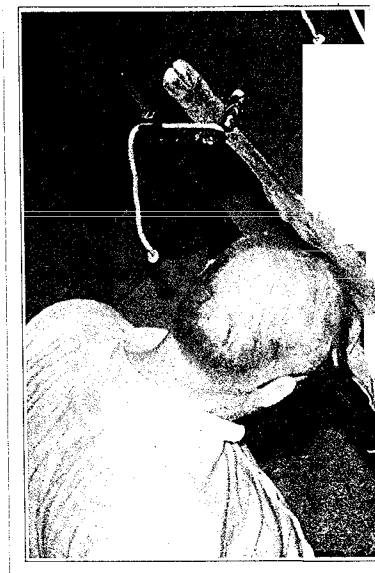

ARTIFICIAL INSEMINATION or AI is a powerful tool for genetic improvement in farmed Fallow deer: Genetic material from high merit bucks can be disseminated more than would be remotely possible by natural mating, and farmers are able to access this material at considerably lower cost and risk than through buying the animals themselves.

What's more, AI offers a safer, more cost-effective means of international exchange of genetic material.

Recent studies on applying AI in farmed Fallow deer have led to the establishment of protocols which have consistently yielded satisfying results. Consequently, commercial AI in Fallow deer is a reality in NZ, Australia and North America.

There seems little doubt that the most successful method of AI in this species is laparoscopic intrauterine insemination. The success of this technique depends greatly on precise timing of treatments, operator skill and good animal husbandry. The following notes are a guide to farmers wishing to use AI to access exotic genetic material.

Facilities: Suitable handling facilities and expertise are necessary for any AI programme. The deer must be able to be yarded and handled efficiently at any time.

The minimum requirements in covered yards include an efficient animal restraint system (ie crush/cradle/bale), a working area (preferably with a concrete floor) of about 16 square metres, water reticulation and electric power (either mains or generator supply). Holding pens should be able to house at least 50 deer comfortably at any one time.

Selection of does: The best results will be obtained only if the recipient does are well managed and healthy. Farmers should ensure their best does are used; we suggest they be selected on age, liveweight and previous reproductive history.

Avoid using yearling (pubertal) does where possible. Our data indicate non-parous does have poor synchrony of oestrus/ovulation after CIDR (controlled internal drug release) device withdrawal, and this will lead to lower conception rates to fixed-time insemination.

If the use of yearling does cannot be avoided, it may be wise to programme the AI about two weeks later than for parous does.

Adult does should be selected primarily on previous reproductive history. We recommend that all does to be inseminated have a history of rearing fawns and be weaned of their latest fawns at least one week before CIDR devices are inserted (late March in NZ/Australia, and late September in North America).

All does to be inseminated should be heavier than 43 kg at the time of CIDR device insertion. If semen from heavy bodyweight sires such as Mesopotamian Fallow is to be used, it would be wise to select the heaviest does that have reared three or more fawns. This will minimise the chances of difficult births because of large birth weights.

Does in the AI programme should be on a high level of nutrition during and after the synchronisation treatment. Stress should be minimised, particularly between CIDR device withdrawal and insemination.

Oestrous synchronisation: Techniques for synchronising oestrous/ovulation in Fallow does have been researched extensively and a standard protocol has been established for the use of the intravaginal CIDR device (CIDR-type G: 9 per cent progesterone; Agricultural Division, CHH Plastic Products Group Ltd, Hamilton). CIDR devices are inserted intravaginally for 14 days and removed late in the rut (ie late April/early May in NZ and Australia, or late October/early November in North America.

Attempts to synchronise does too early in the season will result in poor oestrus synchrony and an increased failure of ovulation. Best results are obtained in the four-weeks following the rut (ie May in NZ/Australia and November in North America).

Oestrus will normally be exhibited 40 to 56 hours (average of 48 hours) after the CIDR device is withdrawn. Individual does will ovulate 24 hours after the onset of oestrous behaviour — that is, an average of 72 hours after the CIDR device is withdrawn.

The timing of the withdrawal of the CIDR device in relation to the planned time of AI is critical, and farmers and vets must ensure the correct protocols (as supplied by the inseminators) are followed.

The use of PMSG (pregnant mare serum gonadotrophin) at or near the time of CIDR device withdrawal is not suitable for Fallow deer because of overstimulation of ovarian activity. Even at low doses there is an increase in multiple ovulations, which leads to lower fertility, higher embryonic loss and more non-viable twin foetuses.

Presence of vasectomised bucks: It has been normal practice to have vasectomised (sterile) bucks with does during the synchronisation

treatment and through to about 10 days after AI (ratio one buck: 50 does).

The bucks should be vasectomised at least six weeks before to ensure complete sterility. Mark all vasectomised bucks well to prevent any confusion with fertile sires.

In the absence of vasectomised bucks, the next best option is to run the AI does adjacent to bucks — but ensure the fence is deer-proof!

Presentation of does for AI: Laparoscopic intrauterine inseminations are performed 65-70 hours after the CIDR devices are withdrawn. The removal of devices is co-ordinated so that groups of up to 50 does are synchronised either for morning, afternoon or evening inseminations (ie up to 150 a day). After the devices are removed, the does are set-stocked in familiar paddocks until they're required for AI.

Additional stress should be minimised during this period. Does should be yarded for AI no more than two hours before the intended start of inseminations. It is probably counter-productive to hold deer in the yards the previous night.

While in the yards, the does need to remain settled. Vasectomised bucks may have to be removed for a while, and overcrowding of does should be avoided. Highly-stressed animals don't perform well under sedation.

Insemination technique: The does are individually restrained in the crush/cradle/bale for the intravenous administering of sedative.

Once recumbent, they are transferred to a laparoscopy trolley and prepared for insemination. Their belly hair is clipped and they are swabbed with alcohol/iodine preparations.

They are then tilted to 30 deg in the trolley for insertion of the laparoscope and insemination pipettes through the abdominal wall, after abdominal inflation with CO_2 gas.

With the aid of the fibre optic equipment, semen is injected directly into the uterus (half a straw per horn).

After insemination and removal of the laparoscope/pipette, the does are removed from the trolley, given an intramuscular injection of antibiotics and an intravenous injection of sedative reversal agent. Sedation is reversed within 1-2 minutes.

The average interval from administering of anaesthetics to complete reversal of sedation is 7-12 minutes.

Post-insemination management: Does should be returned to pasture immediately the anaesthetics are reversed. It would be preferable to return them to the paddock from which they came, and thus provide a familiar setting. Don't disturb them for at least 48 hours.

Replace vasectomised bucks with fertile bucks about 10 days after AI. The 'chaser' bucks will mate 'return oestrus' does (those that fail to conceive to AI) about 21 days after AI. To ensure adequate coverage in case of a high return rate, use a buck:doe ratio of 1:20.

Pregnancy determination: Differentiating between pregnancy to AI and return oestrus is relatively straight-forward using ultrasonography. We scan does 45 days after AI, when the foetus is expected to be 20-22 mm long. Does conceiving to return oestrus 21 days later will not be detectably pregnant by ultrasonography.

Occasionally does will exhibit 'short cycles' and become pregnant 10-12 days after AI. These pregnancies of 33-35 days are easily distinguished from those of 45 days by foetal length and intrauterine diameter.

Success of AI: In the last two years we have performed a considerable number of inseminations using the standardised regimen for oestrous synchronisation and laparoscopic intrauterine insemination. It has been our general policy to use semen that has a post-thaw motility in excess of 50 per cent (the Ruakura Artificial Breeding Centre does not supply semen below this standard), with each straw containing about 50 million total spermatozoa.

Our results have been fairly consistent — 60-75 per cent conception rates both in NZ and the US.

Last year's work in the US confirmed that the regimen was indeed valid (Table 1). In this case, the semen was from F1 hybrid Mesopotamian x European Fallow deer from Ruakura, exported in October.

The does had an average liveweight of about 46 kg and were all in excellent condition. The inseminations were performed in the last week of October (northern hemisphere breeding season) in excellent facilities on the properties of Scott Petty Jr (Hondo, Texas) and Josef von Kerckerinck (Chaumont, NY).

The overall 67.5 per cent conception rate was very pleasing — but probably would have been improved by inseminating about one or two weeks later in Texas where the rutting season had only just begun.

This year in NZ, we performed 547 inseminations on five farms.

A proportion of does on each farm received the standard regimen used ▷

in the US. However, the remaining does were subjected to slight variations in protocols, in an attempt to 'fine-tune' the system.

On Farm 1, we investigated the timing of inseminations relative to CIDR device withdrawal (Table 2). Clearly there is a certain amount of flexibility in the timing of inseminations, with an apparent tendency for improved conception rates to later (70 hours) inseminations.

As ovulation had been observed for a number of does at 70 hours, it is unlikely that conception rates will improve further beyond this time.

On Farm 2, we investigated the effects of vasectomised bucks on conception rates (Table 3). There was not a significant effect (62 per cent vs 68 per cent), but the small apparent difference justifies the present recommendation of running does with vasectomised bucks during oestrus synchronization.

On Farm 3, we investigated sperm concentration (Table 4). While we normally load each straw with 50 million spermatozoa, it is quite clear that numbers can be reduced considerably without lowering the conception rate.

This will have dramatic effects on the number of straws obtained from each contributing buck and on the unit price of straws.

On Farm 4, we investigated different types of CIDR devices (Table 5). Previous studies tended to use type-S devices, but these are now obsolete and have been replaced by type-G devices. Fortunately, this has not lowered conception rates.

On Farm 5, we compared CIDR device synchronization with the use of prostaglandin injections (Table 6). While prostaglandin has been shown to produce a high degree of oestrous synchrony in Fallow deer, the level of fertility observed in the present study is below that of CIDR device synchronization. This may mitigate against the use of prostaglandins.

In general, the studies tended to confirm the efficacy of the established protocols for intrauterine insemination of Fallow deer with frozen-thawed semen. Clearly, it is in everyone's interest that we investigate further the minimum number of spermatozoa required to maintain the present level of fertility.

Our thanks to the farmers and vets who participated in this season's field trials. □

Table 1

Conception for laparoscopic intrauterine insemination of farmed Fallow deer in USA

Farm location	*No. of does inseminated*	*No. of does*	*Conception rate*
Texas	105	67	63.8%
New York	46	35	76.1%
Total	151	102	67.5%

Table 2

Effect of time of insemination on conception rate (Farm 1)

Time from CIDR withdrawal	*No. of does inseminated*	*No. of does pregnant (day 45)*	*Conception rate*
60 h	36	24	66.7%
65 h *	62	41	66.1%
70 h	40	29	72.5%
Total	138	94	68.1%

** control treatment*

Table 3

Effect of buck presence/absence on conception rate (Farm 2)

Buck	*No. of does inseminated*	*No. of does pregnant (day 45)*	*Conception rate*
Present *	53	36	67.9%
Absent	50	31	62.0%
Total	103	67	65.1%

** control treatment*

Table 4

Effect of sperm/inseminate on conception rate (Farm 3)

Sperm no.	*No. of does inseminated*	*No. of does pregnant (day 45)*	*Conception rate*
50×10^6	36	22	61.1%
25×10^6	38	29	76.3%
10×10^6	36	25	69.4%
Total	110	76	69.1%

** control treatment*

Table 5

Effect of CIDR device type on conception rate (Farm 4)

CIDR type	*No. of does inseminated*	*No. of does pregnant (day 45)*	*Conception rate*
Type-G *	44	31	70.5%
Type-S	47	31	66.0%
Total	91	62	68.1%

** control treatment*

Table 6

CIDR device vs prostaglandin synchronisation (Farm 5)

Synchro. treatment	*No. of does inseminated*	*No. of does pregnant (day 45)*	*Conception rate*
CIDR device *	54	38	70.4%
prostaglandin	51	27	52.9%
Total	105	65	61.9%

** control treatment*