Dramatic progress with Fallow AI

Science comes to the rescue of threatened genes

by Trevor Walton

AFTER ONLY a few short years' research, Ruakura scientists are getting 60 to 80 per cent conception rates with AI in Fallow deer — rates which compare well against those being achieved in dairy cattle.

By adapting sheep technology, the scientists have hit upon techniques which work well with Fallow, though they say a lot more research is needed before their systems are perfected. This contrasts with AI in Red deer and Wapiti, where conception rates are still highly variable.

Speaking at the 1990 Fallow Forum, scientists Dr Geoff Asher and Dr Henry Jabbour said their priorities for the next two or three years would be to:

- Develop a diluent for freezing Fallow sperm which will improve sperm motility and longevity
- Develop a fresh semen diluent which will extend sperm life (No comparative studies have been done in this area)
- Optimise the timing of insemination, the size of the sperm dose and methods of oestrus synchronisation
- Extend the oestrus collection period using melatonin

Most exciting, however, is the development of an artificial vagina which is expected to 'go commercial' shortly. This device will enable technicians to collect high quality ejaculate from donor bucks without putting themselves or the bucks at risk.

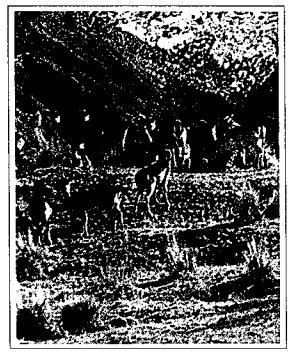
At present, semen collection from males of all deer breeds is by electro-ejaculation (Ej). This involves anaethetising the donor and then stimulating ejaculation by the use of electric shocks, delivered to the rectum by a device similar in size and shape to a bicycle pump.

It's an unpleasant process which most veterinarians involved in AI will be happy to see the last of. Besides, Ej doesn't always deliver sperm samples of adequate quality.

The artificial vagina has been patented, but its design is still something of a state secret. MAFTech is likely to market it commercially to AB Centres and veterinarians.

WHEN A single fawn is conceived as a result of natural mating, the one successful sperm takes some 4000 million mates with him for moral support.

With present AI technology, a single Ej can be divided to produce 23 fawns (using fresh sperm) or 20 (using fresh frozen) when the sperm is delivered through the cervix. When the sperm is delivered directly into the uterus using laparascopic techniques, a single Ej will produce up to 180 fawns (fresh sperm) or 150 (fresh frozen).



Fallow does on a high-country South Canterbury farm

Ruakura now has the 'tools' for farmers wanting genetic improvement in their Fallow herds

That translates to 85 million or 100 million sperm per fawn respectively — a big improvement on nature.

Whether those numbers of sperm are the optimum for AI is unknown and research this breeding season should produce an answer, Dr Jabbour says.

This fine-tuning of the system shows how far the Ruakura team has come since Dr Asher began AI work with Fallow only six years ago. Even then, he says he was criticised for getting involved in work out of the agricultural mainstream.

"Now we're at the stage in the Fallow industry where farmers are wanting genetic improvement in their herds and we have the tools ready for them to do that.

"Not all farmers will want to manipulate their animals to the nth degree, but many will. There are only 120 Mesopotamian Fallow does in the world and only three bucks in the southern hemisphere. AI enables their numbers to be built up in a reasonable time.

"There are also only three Danish bucks in New Zealand. They're another genotype which may have potential."

Asher is a little disappointed that there's been greater interest in AI in Fallow overseas than in NZ.

In the US, where he's well-known for his frequent visits on MAFTech business, about 10 per cent of Fallow farmers are interested in AI.

"We'll be doing 1000 to 2000 inseminations there this season. It's a wonderful way for the NZ industry to make money out of its genetic material without losing any of it."

To be successful with AI in Fallow, two golden rules need to be followed. Don't use yearling does, because they are poor synchronisers. And don't use PMSG (a hormone commonly used to synchronise females of other species); it gives poor results as a result of multiple ovulations and lost foetuses.

Laparascopic interuterine insemination (LII) was demonstrated to farmers attending the field day at the 1990 Fallow Forum.

In essence, the laparascope is a straw-thin fibre-optic telescope which enables the veterinarian to precisely direct the insemination probe through the wall of the uterus without any surgery. It's quite simple to use, but trained professionals are needed to get good conception rates.

Indeed, LII involving any number of ▶

animals is something of a military operation. It's a well-established technology in NZ animal breeding circles, though Asher says it's almost unheard of in the US.

"Immediately post-op the deer are given an antibiotic and an anaesthetic reversal drug. I've never yet seen an infection in Red or Fallow deer."

The animals being inseminated need to be quiet, not stressed and in good condition. Normally two vets and a technician are needed, as well as farm staff to shift stock.

In a prep area — removed from the insemination area to eliminate contamination with dust and hair — a group of animal preppers have the sole job of shaving and swabbing down.

"Once the team is up and running, it takes two minutes to get the animal on the trolley, inseminated and off. The actual insemination takes about 1.5 minutes."

Success with LII largely depends on sperm quality and oestrus synchronisation. But because the inseminators usually don't do the synchronising, the technology is not perfect.

"We synchronise with CIDRs (controlled internal drug release devices) 14 days before insemination. Ovulation occurs 72 hours after CIDR withdrawal.

'It is critical," Asher emphasises, "that the CIDRs are inserted and withdrawn to our direction. It must be to the hour."

Hawke's Bay vet Dr Ian Walker says this means having facilities to immobilise the does for the insertion and removal of the CIDRs.

The Ruakura team recommends running a vasectomised buck with the CIDRed females to enhance synchronisation. It's a technique which works with CIDRed females of other species.

Walker says it's important to get the buck vasectomised several months before the programme begins, or unwanted natural pregnancies may result.

The LII is carried out two to seven hours pre-ovulation (65 to 70 hours post CIDR withdrawal).

Sperm quality should always be checked. A minimum of 50 million sperm with a minimum 65 per cent post thaw recovery rate should be in each straw.

"I suspect," Asher says, "that a lot of poor semen has been sold in Australia, which would partly account for some of the poor results there.

"Even in New Zealand, I am appalled at the way some semen has been sold in recent years. There's no information on how many sperm in a straw and no information on percentage motility on thawing."

Asher and Jabbour advise that only the best does in best condition should be inseminated. They caution that it's a genetic improvement technique — not a tool for early fawning. Indeed, a problem of AI is the crop of fairly late fawns from does which don't 'take' and are naturally mated by a follow-up buck.

Walker advises farmers to involve their vets early in their planning. They should discuss with him or her the logistics of what is planned, as well as the economics.

"A straw of semen will cost from $40 to $1000, plus there are veterinary and other costs. By relating these to the conception rate, you get a cost per fawn on the ground."

In some cases, where facilities need to be altered, it might be better for a farmer to contract out the AI operation to someone better set up.

Walker says the does must be weaned in early April — before the start of the synchronisation programme — and given preferential feeding. This is not for flushing (which doesn't work in deer) but because of the need to have them in good condition.

After insemination, the does should be looked after. As Asher points out, there's no point in spending good money on AI and then not doing the basics like vaccinating for lepto.

Walker says a minimum of stress post-AI is vital: Wait 10 to 14 days post-AI before introducing follow-up bucks and don't yard the does for at least a month.

Forty five days after LII, the does can be scanned for conception rates with a high degree of accuracy — with little or no risk of confusing an AI foetus with one resulting from a follow-up mating. Experience shows a 70 per cent conception will lead to a weaning rate of at least 60 per cent. □

New horizons

LAPARASCOPIC INTRA-UTERINE insemination is only one of a number of techniques with potential for enhancing genetic progress in deer. Others include super-ovulation, embryo splitting and embryo transfer following in vitro ('test-tube') fertilisation.

Of these and other potential techniques, only embryo transfer following in-vitro fertilisation is ready to be used commercially. Clearly, it could enable rare breeds and strains of deer to be bred-up extremely rapidly.

Geoff Asher told the 1990 Fallow Forum that he was taking the ovaries from Fallow does slaughtered at DSPs, maturing them in the laboratory, fertilising the resulting eggs with sperm of high genetic merit and then transferring the embryos to recipient deer.

The technique, once proven, will make use of material normally wasted. It will also enable vets to recover, for breeding, the ovaries from hinds and does of high genetic merit which have died as a result of an accident.

The vet has six or seven hours to remove the ovaries before putting them on ice and sending them to the laboratory. It takes about 48 hours before the ova they shed can be fertilised.

Superovulation, an established technique in other species for rapidly increasing the numbers of prebred animals of high genetic merit through embryo transfer, is a long way off being applied in Fallow.

The technique uses hormone treatments to trigger super-ovulation. These ova are fertilised before being flushed out as embryos for transfer to females of low genetic merit.

In Fallow, superovulation can be achieved but conception rates are extremely low.

Embryo splitting is another technology with possibilities, but probably only for research work — because it provides animals of known identical genetic background.

Gene splitting and gene fusion techniques are well-established in laboratory animals, but Asher says this technology is still a long way off in the deer world. □