



Reflections on multiple embryo transfer programmes in alpacas

by Ian Braithwaite, Patagonia Alpacas
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Late in 2004 we decided to experiment with the advanced reproductive technique of embryo transfer. It was a big decision to make for our small stud as the technique has only recently evolved from an experimental research challenge in alpaca breeding to a potentially useful commercial breeding tool. As the results can vary dramatically between ET programmes and across different studs, the following discussion highlights some of the issues and challenges that we had to face as novice users of this technology

What is Embryo Transfer (ET)?

ET is a reproductive technology where a donor female alpaca is given a natural mating and any resulting embryos are collected and implanted into the cervix of recipient females. It is important to emphasise that the ET technology developed in Australia is a non surgical technique designed to minimise trauma to both alpacas and their owners! There are two forms of ET, single ovulation and multiple ovulation.

What is a single ovulation ET in alpacas?

Single ovulation ET occurs when a donor female (most likely to be a maiden but does not have to be) is given a natural mating and the embryo is flushed from the donor and implanted into the recipient female. Originally, the fieldwork by Dr Jane Vaughan and Dr David Hopkins used single ovulations. This allowed both vets to obtain expertise in the non-surgical flushing and transplanting of embryos. Once the technique had been mastered, both vets then focused on developing a safe and efficient protocol for super ovulation in alpacas.

What is multiple ovulation ET in alpacas (MOET)?

MOET is a hormonal treatment to increase the number of follicles developing in the ovaries of the donor female alpaca. At the appropriate stage, the donor female is given a natural mating and about four recipient females are prepared to synchronise their reproductive status with the donor female. Then some days later, the donor female is flushed and any recovered embryos are individually assessed for quality and then implanted into the cervix of the recipient females. Unfortunately it is not possible to determine the sex of the embryo!

According to Jane Vaughan, the number of embryos recovered in alpacas varies widely between 0 - 14 embryos. The average of 2.5 - 2.8 embryos/do-

nor female is calculated across both successful and poorly performing programmes. The average is gradually increasing due to a combination of a refined superovulation protocol, breeders adjusting their day-to-day management practices and learning how individual donors and recipients respond to the technique.

Myths about ET

There appears to be three myths about ET which I would like to contest.

The first one is that all the ET progeny will have a similar phenotype where they look identical to each other in fleece quality and colour. The ET technology developed in Australia does not produce identical clones. It merely accelerates the number of progeny that can be produced in a given period of time but the progeny will exhibit the same degree of variation that we already see in our normal breeding programmes. We saw a good example of this from our first ET drop where one fawn donor female mated to a fawn sire produced a white cria, a medium fawn cria and a dark brown/bay black cria. There is one standout animal, one handy animal and one fairly disappointing result. Similarly in another herd, we have seen a case of three ET crias from the same donor female with three markedly different crimp styles!

The second myth that seems to have some currency is that ET can not be used by small breeders and the last myth is that ET will reduce the value of average quality stock.

Jane recommends a minimum of three or four donors per programme. With our small herd, we just meet this minimum requirement. Last year we ran three programmes with only three donors in each programme and collected 22 embryos. We could have used more donor females but in our view it would have compromised the selection pressure.

So what can you do if you don't have four suitable

donor females? I would recommend you consider work collaboratively with other small breeders in this region to make a collective booking for Jane Vaughan. If you do this you will need to place all the animals (donors and recipients) on the one property one month prior to the start of the programme. However be aware of the implications for both Q Alpaca and the MN JD programme. Due to stress, Jane recommends against moving the donors and recipients on the flushing day. Finally, you might decide to try single ovulation rather than multiple ovulation, particularly if you are short of recipients.

Lastly, the concern about the declining value of average quality stock due to a possible increase in the number of better quality stock has always been a feature of the alpaca market.

In our near ten years in the industry we have heard this argument used a number of times. It was initially said that if you did not have one of the famous group of Purrumbete females you would not be able to compete. Then it was said that the widespread arrival of Peruvian stock would destroy the value of Chilean bred stock. Probably what is most important for any breeder is to work out the best method for increasing the quality of their stock that suits their budget and business plan. This might be done by developing focused breeding objectives, learning to be more discriminate in your mating decisions, joining the AGE genetic evaluation programme, and lastly, taking advantage of the growing demand for fertile recipients. Swapping or selling your own lower grade but fertile females gives you the option to reshape your own herd by acquiring better quality females or males.

Why consider using ET?

The aim of either single or multiple ovulation ET is to increase the number of offspring produced from high grade females by increasing selection pressure on the female side of the breeding equation.

As an industry, one of the barriers to increasing the rate of genetic improvement is the idea that we do not need to apply any selection pressure on the female side. A widely held practice in the industry is to mate the lower grade females each year and hope that the joining sire produces a miraculous leap in quality. Occasionally this may occur although from a genetic perspective, there is a strong body of evi-

dence to suggest that the next generation's progeny would tend to revert back to the industry average.

As breeders, we found it initially hard to accept that we did not have the skill to improve certain females irrespective of whatever male we chose for the females. But imagine how you might feel when you see their first ever gorgeous cria after all these years of persevering with natural matings simply due courtesy of one of your better donor grade females!

The traits that you might not be making progress with may be confirmation (you still need easy birthing females with wide pelvises), under/over shot jaws, multitis, or one of the many fleece traits such as fleece weight, micron or evenness etc. Providing these 'difficult to improve' females have three other key traits – good mothering, high fertility (fall pregnant on the first or second mating), and easy birthing, these girls still have an excellent breeding future ahead of themselves as surrogate mothers.

Challenges associated with using ET

It is important to also be aware of some of the challenges associated with ET. Ultimately a decision to try ET out or not is dependant on how you weigh up the pros and cons of the technique for your business.

- ET requires very detailed planning well in advanced of the start of a programme. Issues that need to be considered are: 1) how many donors to use?; 2) which males to use – will you need to rely on your own males or do you need to use outside males?; 3) how many recipients do I need – which girls am I willing to temporarily retire from natural matings and do I need to acquire some new recipients and how much am I going to pay for these recipis?; 4) what number of progeny would I like from each donor if I had that luxury of choice (on the flush day you must decide this issue based on the number of embryos recovered and the pool of available recipients); and 5) do I have the required standard of donor females and stud males to justify the investment in ET?

This last point is very important to consider as the cost of ET progeny is higher than non ET progeny. Based on our first programme, each ET cria born has cost us about \$1,000 each. Note that this estimate only covers Jane Vaughan's

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ET charges (if you have a more successful programme and have a higher stick rate of embryos, the cost might drop to about \$700/cria). This figure also includes some other drug and feed costs. However, in our situation, it does not include any fees for outside stud services as we used our own males. The use of non owned males could easily double the cost of each ET cria. So obviously you need to be aware of the potential value of the offspring produced from an ET programme to decide whether ET is viable for your business. ET is just as capable of producing a dud animal as it is of producing a good animal.

- Due to the number of times you need to inject the donors in multiple ovulation ET, the females do become reluctant to come into your injection area in the morning and evening. This means that you may need to change or improve your infrastructure leading to your injection area and have special feed incentives for the donors. On our farm we had to build a new lane system in conjunction with new paddocks and new watering points.
- Making a commitment to give ET a go does take a lot of time, labour, capital and attention to detail. Additionally, it is a wild emotional roller coaster with significantly high and low moments. This is because of a number of unknowns: 1) how will animals will respond to the programme?; 2) how many embryos will they produce?; 3) what is the stick rate of embryos going to be like in the recipients; and 4) 12-18 months later when you see the progeny, how good were your ET mating decisions? The risk with ET is that you might bulk up your bad mating decisions!
- Under the latest multiple ovulation ET protocol, you need to feed up your donors and recipients one month before the start of the programme. Then you are regularly committed to a 6.00pm and a 8.00am injection schedule across several weeks of the following month.
- A common problem across other livestock as well as alpacas is the variability of response to the multiple ovulation drugs combined with some recipients having a poor history of retaining an ET pregnancy. Some donor females may over respond to the hormones and produce too many low grade embryos, other females may

not respond at all, finally some donors respond inconsistently between programmes. Based on the current charging model, if you have a disappointing programme and do not produce any embryos, your direct charges will only include a flush fee/donor and a travel fee as there will be no implant fees for the recipients. Unfortunately, the only way to work out which donor females and recipients are unsuitable is to try them out several times. Jane Vaughan has a 'three strikes and your out' rule-of-thumb.

- ET success relies on a degree of luck as well as more importantly, calm management of animals. Stress can play a part in influencing a donor's response to the ovulation drugs as well as affecting the stick rate in the recipients. The first 60 days after implanting is the critical period for the recipients. This has implications for a number of normal management activities including weaning, shearing, spit-offs and injections that require any form of mustering.
- While ET allows the breeder to apply selection pressure on the female side, it inevitably leads to an increased level of inbreeding on both the male and female side. This issue needs to be managed very carefully. It will become more of an issue when there are several generations of ET progeny.
- Finally, I believe you need to be sensitive to animal welfare issues. It is very common for people who assist on the ET flush day to remark that they were surprised how stress-free the flushing and implant procedure was and wish that it was a shame that shearing day could not be as stress-free!

However an area that Cathi and I fell strongly about is that donors are allowed to have some opportunity to raise their own cria naturally. After three programs, we retired all of our donors as we wanted them to be mothers again. Retiring donors allows you to use new male genetics that may not be available for use in an ET programme.

Conclusion

I have tried to produce a balanced discussion about our experiences with four ET programmes done over a 13 month period and with our first ET drop of crias. We are happy with our results so far but are going to scale back the number of ET programmes we do this year while we review the quality of our next three drops of ET cria. ET is a worthwhile option but you need to see if it suits your lifestyle, your animals, your budget and your breeding objectives.

Ian with his partner Cathi, have been breeding alpacas since 1996. Ian is doing a doctorate examining the adoption of breeding technologies in the sheep industry.

Patagonia Alpacas

www.patagoniaalpacas.com.au