SVES RECIPIENT COW SELECTION & MANAGEMENT

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Recipient Selection

Recipient (surrogate) cows are vitally important to the success of transferred cow embryos. Think of them as an armored car. They will be carrying a very valuable commodity – your donor cow's embryos. They should be good mothers, docile, give plenty of milk, and have adequate size to give birth to her embryo baby. Above all they should be fertile! The following dos and don'ts should help.

DOs

1. Do choose fertile cows. If you are acquiring recipients immediately prior to or during the breeding season, the best choice is a cow in good body condition with a baby calf at side 60 days or older. Make sure she has not been with a bull and is not early pregnant to the seller's bull. Having a calf at side does not guarantee fertility but is a good indicator of it. Consequently, dry, non-lactating cows without a calf at side are potential problem breeders – something you do not want in your herd.
2. If you must acquire your recipients from another source either select cows seven to nine months bred and calve them out, or buy cows with calves 60 days old or less. Cows with older calves (three to four months) could be pregnant to a bull. This could result in abortions when synchronizing for heats later on. I have seen this happen hundreds of times over the years.
3. Recipients must be purchased well in advance of expected use. For example, a young, thin cow with a 60-day-old calf at side may not cycle until her calf is weaned. That would tie up money and space for a long time. If you acquired her as a heavy bred cow two to three months before calving, you could supplement her to be fleshy and cycling by the time her calf is two months of age (see Figure 1). She would also be better acclimated (minimizing stress) to her new surroundings before transferring an embryo into her.
4. Middle-aged cows (four to eight years old) are usually easier to get pregnant than are older cows or cows with their first calf at side. Having said that, first calf heifers in really good flesh yield very high conception rates on transferred embryos. Virgin heifers are very fertile as a rule, but usually do not wean heavy calves. Heifers may also require assistance at calving depending upon the sire and dam of the embryo.
5. Do have newly acquired recipients examined prior to purchase. Reproductive problems can be detected thus avoiding the unnecessary expense of purchasing a non breeder.
6. Do select recipients from your existing purebred or commercial cow herd when possible. These cows are obviously acclimated to their surroundings (i.e. ranch boundaries, fences, corrals, nutrition, water, geographical local, and ranch personnel). They also have a natural immunity to the diseases endemic to the area.

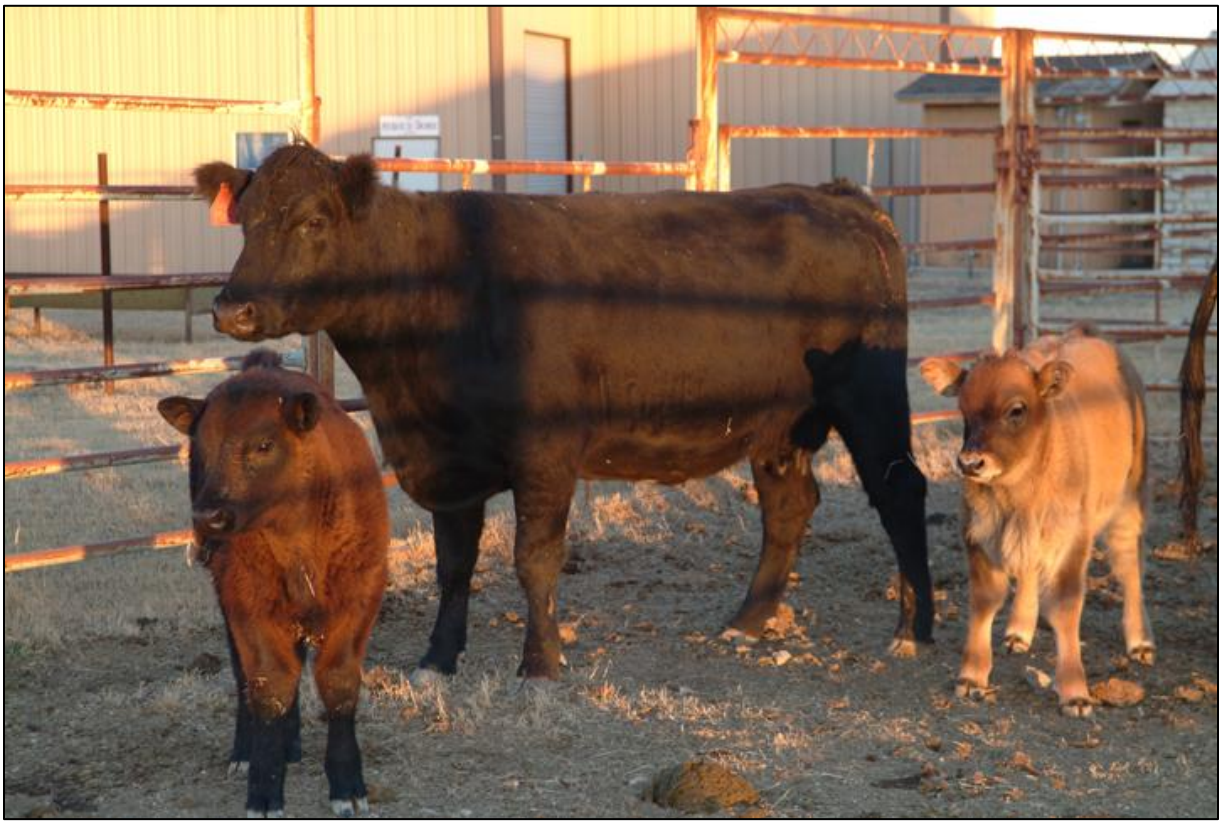

Figure 1. Recipient in good body condition.

DON'TS

1. Do not select potentially sub fertile cows as recipients! It is very tempting to use open (not bred) cows from your herd after exposure to bulls or artificial insemination (AI). However, if the bull could not settle her an embryo probably will not either. A wiser decision would be to hold your fertile cows away from the bull while their calves are young in anticipation of using them for recipients. This obviously requires planning well in advance of expected use.
2. Do not purchase recipients at a sale barn if at all possible. Remember most farmers or ranchers sell mature cows at a sale when something is wrong with them (i.e. sick, wild, poor milkers, or not pregnant). An alternative would be to purchase cows either heavy bred or with calves at their side from a ranch or farm well in advance of needing them.
3. Avoid purchasing cows with too much Brahman influence as they can have very large and crooked cervixes. This condition makes it very difficult to pass the embryo transfer (ET) gun through the cervix without causing a lot of trauma, which lowers conception rates on embryos.
4. Do not purchase wild or fractious females as recipients for obvious reasons. They can hurt people.

Nutrition Management

Reproductively, a cow performs her best when she is in moderate body condition. Cows that are too fat are the most difficult to get bred. Cows that are too thin often will not cycle so they do not have a chance to breed, and if they do cycle the odds of pregnancy are reduced. One interesting contradiction to thin cows as recipients is that if they are cycling and they have an embryo transferred into them they will get pregnant if they are fed well enough to gain weight for the next 45 days. The key point to successful conception rates is a term we call energy balance. If a cow goes into negative energy balance (weight loss) post transfer, the conception rates decline significantly. Conversely, if a thin female goes into a positive energy balance (weight gain) post transfer, the conception rates are usually acceptable.

If a cow breeds back 82 days after she calves she will calve at 12-month intervals. This is a common goal of commercial cattle breeders. It is a lofty, yet achievable goal with recipients if they are well-managed nutritionally.

The following describes a healthy, well-nourished cow's breeding cycle:

- She calves in good flesh (example, Jan 1st). She is now in a neutral energy balance.
- She begins cycling at 40 days post calving (Feb 10th). She should still be in a neutral energy balance if good feed and forage is available. It is important to note that first calf heifers, even in good body condition, may not have their first cycle for 75 to 90 days after calving.
- She conceives on her second or third cycle (day 60 to 80 post calving, or Mar 20th in this example). If properly supplemented or grass is good quality, she should still be in neutral energy balance (moderate body condition).
- Her calf is weaned at seven months (Aug 1st). As her calf ages, it requires more milk. A big, strapping calf the last couple of months before weaning usually throws her into a negative energy balance causing her to lose weight. Weaning the calf shifts the balance back to positive.
- She stays dry (non-lactating) until calving again on Jan 1st. This is a period when she should replenish her flesh, which puts her in a positive energy balance.

Things that change the balance of energy:

1. Difficulty at calving – If a cow needs veterinary assistance at calving she can feel bad for several days and even go off feed. A nursing newborn needs milk and a good cow will make it, but possibly at her own body's expense. She begins to break down her own body fat to make milk for her baby. She is now in a negative energy balance and begins to lose weight. If she retains part of her placenta this weight loss can continue for several months until treated.
2. Quality of available forage – Hay, silage, or better yet grass from the ground is the single most important constituent of a cow's diet. Depending on where you live, growing conditions can vary significantly from month to month. For example, in North Texas nutritionally the worst months of the year are February/March for the winter and August/September for the summer. The quality of grass during those times is usually poor. Cows should be supplemented accordingly. If she has a strong five to six month-old calf suckling during either of these periods the energy balance can sway to negative very quickly.
3. Extended cold/wet or hot/dry periods can take its toll on cows and put them in a negative energy balance.

Recipients are often overlooked at the feed bunk. However, if we expect them to perform (breed and raise good babies) they must be maintained on a good nutrition program. The last three months of pregnancy are crucial, nutritionally speaking, relative to how soon a cow will breed back after calving. Remember that lactation is the most stressful time in a cow's life – a suckling calf drains her energy reserves quickly. If she is thin at calving and goes directly into heavy milking, she may not cycle (have a heat period) until her calf is weaned. Furthermore if she does cycle while in poor flesh and lactating, her odds of getting pregnant are reduced. If she calves in good flesh, she may cycle and breed back in 60 to 100 days after calving.

If your cows are not coming into heat after being injected with a heat drug (Lutalyse®, Estrumate®), more than likely they do not have adequate energy levels to produce milk for the calves plus cycle and breed (see Figure 2). It should be noted that these drugs will not bring a cow into heat unless she has cycled by herself the first time since calving. It is a cow's way of telling you she is not ready to breed – "Do not put an embryo in me if I am not cycling!"

Check with your veterinarian or nutritionist for consultation well in advance (at least 4 to 6 months) if you need help. The main point to be stressed is that nutritional supplement, if necessary, may need to be initiated weeks in advance of anticipated breeding. Don't be near as concerned about trace elements and vitamins are you are with protein and energy supplements. Protein and energy are by far the most limiting nutritional factors concerning fertility in cattle.

The above concepts hold true for all breeding cattle whether recipients, donors or natural mating.

Figure 2. Thin cow in negative energy balance.

Synchronizing Recipients

When an embryo is flushed out of a donor cow, it is seven days old. This means the donor cow was in heat seven days ago and was inseminated so that the egg could be fertilized and developed to the day 7 stage. A healthy day 7 embryo contains from about 50 to 125 little cells called blastomeres. There are several reasons that day 7 is important when it comes to flushing embryos from a donor cow:

1. The embryo is still contained in its shell (see Figure 3), which means that the cells of the embryo are protected against disease and physical trauma while in the uterus.
2. The shell acts as a physical barrier to the shock of freezing and thawing.
3. The cells are at a stage where they can withstand the rigors of freezing and thawing. Embryos flushed at day 5 or day 9 would likely die if they were frozen and transferred into a recipient.

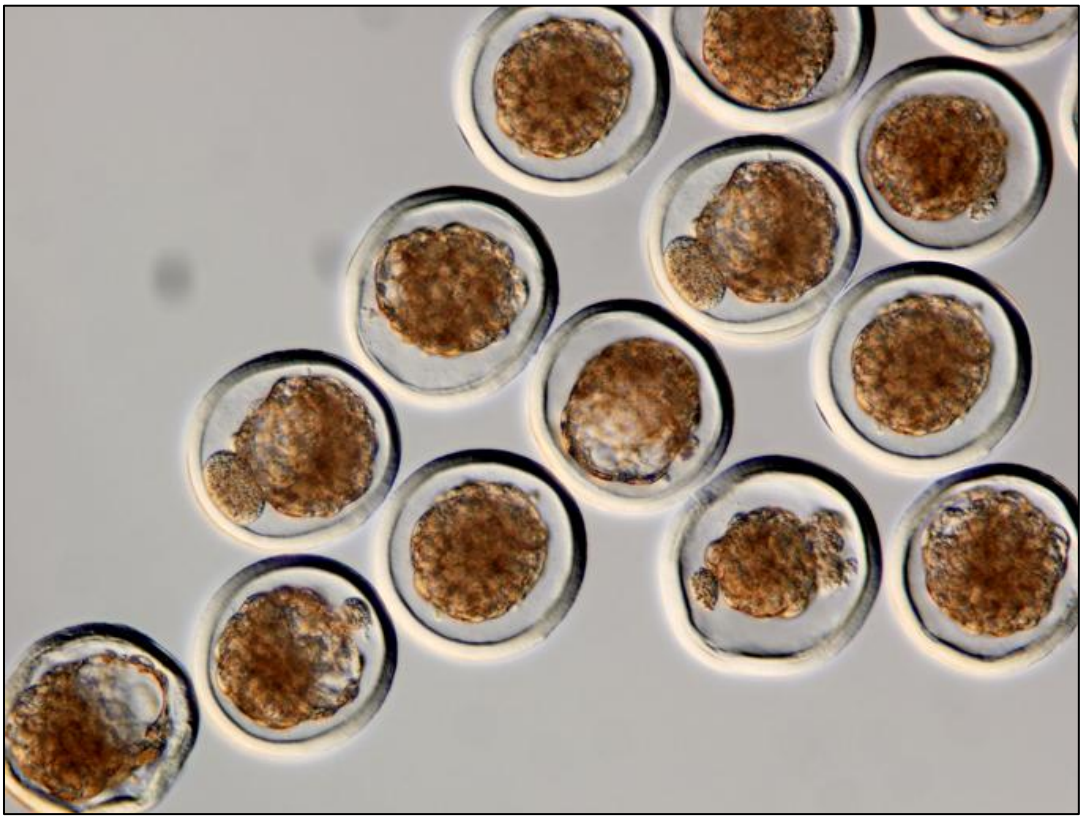

Figure 3. Day 7 embryos with intact shells (round, thick circle surrounding the embryonic cells).

The early developing embryo is a very sensitive little creature that requires an almost perfect environment in which to survive. Each day during the first 21 days after breeding, a cow's ovaries produce varying amounts of hormones which are responsible for normal embryonic development and pregnancy retention. This means that a seven-day-old embryo that has just been flushed from a donor cow needs to be placed into the uterus of a recipient cow that was in heat seven days ago. Actually, there is some leeway for synchrony between the embryo and a recipient. A day 7 embryo can be transferred into

day 6, day 7, or day 8 recipients without any decline in conception rates. So, what we are trying to say is that the reproductive tracts of both donor and recipient should be synchronized together, thereby retaining continuity of hormone environment so as not to disrupt embryonic development after being removed from the donor and transferred into the recipient.

This reproductive synchrony (getting heats close together) is usually accomplished using prostaglandins and or controlled internal drug release devices (CIDRs; progesterone-containing devices). Prostaglandins are a class of drugs that make a cycling cow come into heat at a specified time after being injected in the muscle. Examples of prostaglandins are Lutalyse® and Estrumate®, but there are others. For the sake of this article, Lutalyse® will be used instead of the word prostaglandin. Cows normally respond (have a heat period) about two to three days after being injected with a shot of Lutalyse®, but this will vary from one to seven days after the injection. Under certain conditions, some cows will not respond to Lutalyse® at all. It is imperative that a recipient manager understand when a cow will <u>not</u> respond to Lutalyse®.

Please learn the following facts about prostaglandins:

1. Lutalyse® will not bring a cow into heat that has not had a natural heat period since her last calf was born (i.e. thin, undernourished cows).
2. Lutalyse® will not bring a prepuberal heifer (one that had never cycled or hit puberty) into heat. After having her first natural cycle she will start responding to Lutalyse®.
3. Lutalyse® will not bring a cycling cow or heifer into heat if she has been in standing heat in the last five or six days.

The above three facts account for most prostaglandin synchronization "failures." These three facts account for more embryonic death loss than any other factor in the ET industry besides poor nutrition. Here is an example of exactly how this happens (the dates used are simply an example of a timetable to give some perspective):

1. A recipient manager injects 10 prospective recipients with Lutalyse® on January 10th to synchronize their heats with his donor cow who will be in heat on Jan 13th.
2. The expected flush and embryo transfer date will be Jan 20th.
3. The expected window of opportunity of heat for these recipients is January 12th, 13th, and 14th.
4. After Lutalyse® on Jan 10th, he observes two of the recipients in heat on Jan 12th, three more on Jan 13th, and two more on Jan 14th. Seven of the ten responded with standing heats in the acceptable window of opportunity.
5. Three of the recipients did not show heat.
6. His donor produces 10 good embryos when flushed on Jan 20th.
7. The flushed embryos were fertilized seven days prior to flush day when the donor was in heat and inseminated.
8. The embryos need to be placed in a reproductive tract that was synchronized with the donor cow who was in heat seven days ago. Recipients who were in heat on Jan 12th, 13th, and 14th are in close enough synchrony to receive an embryo on Jan 20th (flush day).
9. Of the seven cows that were in heat in the window of opportunity, six received embryos from his flush of 10 embryos.

10. One of the seven had a cystic ovary so she did not receive an embryo. Of the three recipients that did not show heat in the window, two were active in the window but did not have an observed mount.
11. The two that were active on Jan 12th were examined by ultrasound on flush day (Jan 20th) and were found to have a corpus luteum (CL). Unfortunately, we cannot age a CL with an ultrasound.
12. If the two active recipients had been in heat the day before Lutalyse® (Jan 9th) they would not have responded to Lutalsye (see fact #3 above). Assuming their heats were on Jan 9th, the CL that is observed on Jan 20th is actually 11 days old (Jan 20th flush day minus Jan 11th heat day).
13. If we put an embryo into those two recipients they will likely not conceive.
14. Thirty days later, when it is time to pregnancy test all the recipients, the day 11 recipients will not be bred.
15. Of the other six recipients that were observed in standing heat during the window of opportunity and received an embryo, four will be pregnant.
16. Pregnancy rates with the good window recipients are an acceptable 66% (4 of 6).
17. Pregnancy rates with the non-observed (only active) recipients is 0% (0 of 2).
18. The overall pregnancy rate is 4 of 8 or 50%.

Until a recipient manager understands the above facts and scenarios he will experience low and inconsistent pregnancy rates on embryos transferred into his recipients. When he understands the three facts above concerning Lutalyse® and the importance of nutrition, he will begin achieving consistently acceptable conception rates on transferred embryos. The moral of the story is to only transfer embryos into recipients with observed heat dates that put the recipient into close synchrony with the donor or frozen embryos.

Consider the following average numbers from most ET programs to get an estimate of how many recipients you may need for your program:

1. The average flush from a superovulated donor yields seven transferrable embryos, of which four to six are of freezable quality. It would be nice to have exactly that many recipients on flush day, but the average flush fluctuates from zero to 50 embryos on any given flush. If you have eight recipients ready on flush day and only flush one embryo to transfer, a tremendous amount of money, time, and labor have gone to waste. The reversal is to only have one recipient ready on flush day and eight embryos to transfer with none of the eight being of freezable quality.
2. The average pregnancy rates on fresh transferred, grade one embryos is 60% to 70%. That is for every 10 embryos transferred into recipients, six or seven of them will result in a pregnancy. This rate varies depending on recipient selection, management, and embryo quality, as well as dedication, understanding, and commitment on the part of the recipient manager and/or owner of the operation.
3. The average number of recipients that respond to a single prostaglandin injection is 60%. This is only true if all recipients injected are known to be cycling. The percentage response can increase if heat is detected daily for five days prior to the scheduled Lutalyse® injection date, and cows observed in heat during those five days are not treated with Lutalyse®. This practice may not be a practical option for breeders with a busy schedule.
4. Not all recipients that are synchronized for a flush can be transferred into. About one in 10 will either be cystic or have no detectable corpus luteum (ovulation blood clot).

One can see that it takes a reasonably large ratio of recipients on hand to achieve pregnancies. If four pregnancies are produced from a flush, it took seven recipients to be transplanted into. Of the recipients that were transplanted, eight were synchronized but one was cystic (a normal finding), so seven were transplanted. To get eight synchronized in the window of opportunity, 14 head were given Lutalyse®. The ratio of available recipients to pregnant recipients is 14:4 or about 3.5:1. Sound economic judgment must be used before beginning an ET program. Again, this ratio can be reduced to 2:1 if strict management practices are utilized (highly fertile and well-fed recipients, strict heat detection, highly skilled ET technician, and minimized stress both prior to and after transfer). Also, a large frozen embryo inventory will assure that every recipient synchronized for a flush will receive an embryo.

After Transfer

After recipients have been transferred into, they should be left as undisturbed as possible. Preferably, they should be put in a separate pasture so they are not stressed during gathering and sorting of the non-exposed recipients for further ET procedures. Make sure these cows do not lose weight during the first 90 days after transfer or have any major stressful event. The first trimester of pregnancy is the most sensitive to abortions and early embryonic death! Simply changing diet can cause early embryonic death, presumably from rumen pH changes – it does happen!

The bottom line is that good management practices gets recipients pregnant and keeps them pregnant. You should expect a normal abortion rate of about 4% to 7% after pregnancy exam at 30 days post transfer.

Priorities and Philosophies

Every purebred ranching operation has a different set of goals, priorities, and environmental surroundings. High pregnancy rates on transferred embryos may be the ultimate goal for one breeder, whereas 40% pregnancy rates may suffice for the next. It does take a tremendous amount of effort and monies to achieve 70% pregnancy rates (totally dedicated efforts towards the ET program), which takes management away from other ranching duties. A breeder must determine priorities and make adjustments accordingly.

The preceeding information should be a reasonable guide to selecting and managing recipients from purchase through pregnancy. It obviously takes time and planning well in advance to achieve success. Good luck! Dr. Stroud recommends purchasing prospective recipients at least 90 to 120 days in advance of transfer so cows can acclimate to their new environment.

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