

## Thoughts On IVF Embryo Production In Shorthorns

### Resumption Of The Shorthorn Bulletin:

With the reduction in our Heritage Shorthorn cow herd I currently have increased flexibility and more time to devote to other endeavors. I had many subscribers contact me expressing disappointment that I was no longer writing the Shorthorn Bulletin. After much thought I have decided to resume writing it but not follow a specific schedule. There certainly are a plethora of topics I can write about the cattle industry as it continues to evolve and as Heritage Shorthorns become more popular. In the near future I will be writing a couple of articles covering my recent trip to Australia which hopefully will provide some insight into the Australian Shorthorn Industry.

### Farm Update:

To say late Spring and the first part of Summer were dry is an understatement. We only had 0.25" of rain from April 20th until late September. Unfortunately that necessitated the feeding of hay starting in late July. Fortunately late fall rains allowed for some pasture regrowth. It is extremely expensive to raise cattle in our part of the USA because of long dry periods each year. Our cows and calves are all doing fine despite the difficult weather. We will again have a very eclectic calf crop this coming Spring sired by a very rare collection of quality, old, Heritage Shorthorn bulls.

### Types Of Embryo Production:

When considering embryo production the methods available include conventional and in vitro fertilization (IVF). With conventional embryo production (CEP) the cow is hormonally super ovulated, bred, and the embryos are flushed out of the uterus to be implanted immediately in recipient cows or frozen for later implantation. With IVF the cow may or may not be super ovulated before ovum pickup (OPU). The ova (eggs) are collected directly from the cows ovaries by ultrasound guidance, fertilized, and placed in specialized growth media in a petri dish under regulated temperature conditions to produce embryos which are to be implanted fresh or frozen for later use.

### Why I Chose IVF:

One of the big advantages of IVF over CEP is that small amounts of semen (partial straws or ampules) can be used to fertilize many ova from many different cows at the same time in separate petri dishes, while with CEP only one cow can be bred using either two straws or ampules (one in each horn of the uterus) to breed the cow. The fact such a small amount of semen can be used with IVF embryo production is a huge advantage over CEP, especially when using rare, expensive semen. If a breeder has the luxury of large amounts of reasonably priced semen then CEP may be the better way to go, although most embryo production today is IVF. The other big advantage of IVF over CEP is that cows pregnant up to 90-100 days of gestation can be used for embryo production while pregnant cows can not be used for CEP because hormones are used that will cause abortion. Since the emphasis with our own Shorthorn herd is to maximize embryo production from limited amounts of rare semen (in some cases only 1-2 ampules left in the world) it is necessary to use IVF.

## Fresh Or Frozen:

As one would suspect there is wide variability in the numbers published for the success rate after embryos are implanted. In general the success rate for fresh embryos is 10% high than with frozen embryos. Anything over 40% with frozen embryos is considered good while anything above 50% with fresh embryos is reasonable to expect. There are many factors that affect the success of implantation that must be considered beyond simply the quality of the embryo. Several of these factors are discussed below.

## Managing The Donor Cow

There is a large variability in the numbers of oocytes produced by donor cows undergoing the collection procedure. Some cows simply are better quality oocyte producers than others. No amount of "special management" can create a super donor cow. Cows with a condition score of 5-6 are ideal. It is most important that she be gaining weight to maximize the "flushing effect". Many breeders use Multimin 90 as a supplement in IVF embryo production in both the donor and recipient cow. The healthier the cow the more likely the chances of producing good quality oocytes that can be successfully fertilized and result in large numbers of quality embryos.

## Choosing And Managing The Recipient Cow Prior To Implantation:

I prefer large cows with large pelvic diameters for recipients because they provide extra flexibility when it comes to calving ease. There is not the tendency to have large, oversize, calves with IVF embryos like is often seen with CEP calves but it still can occasionally occur. An age range of 4-8 years is ideal because these are often the most fertile years of a quality Shorthorn cow. Ideally many breeders want to use a cow that does not have a calf nursing on her because she is less stressed and therefore more likely to conceive, although I have had good success with quality cows which are nursing a calf. Recipient cows should have a very calm disposition because excitability during pregnancy can have negative epigenetic affects. Beyond that if she is a "nut job" her IVF calf will tend to be the same just from watching her overly anxious reactions. Cows that are feed efficient with good udders, and have excellent milk production, are essential to maximize the growth of the calf. Finally a cow that has great maternal instinct will increase the chances of raising a happy, healthy IVF calf. Using a poorly conditioned, cull cow as a recipient is not a wise way to "save money".

## Selecting The Bovine Embryo Technician:

I cannot overemphasize the importance of using an experienced, quality, Bovine Embryo Technician as it is the greatest guarantor of success in IVF embryo implantation. I strongly believe that using a Technician certified by the American Embryo Transfer Association (AETA) results in the best chance of achieving a successful IVF pregnancy in a recipient cow. Their website ([www.aeta.org](http://www.aeta.org)) lists all their certified members throughout the USA. Certification requires a special program and exam followed by continuing education so a AETA member is up on the latest techniques and synchronization methods for IVF embryo work.

## Post Implantation Considerations:

Managing the recipient cow properly post implant can further enhance the chances of a successful ET pregnancy. Maintaining proper nutrition, vaccinations against abortion diseases, and minimizing stress can all contribute to a positive outcome. The greatest risk during an IVF pregnancy in recipient cows, once they are confirmed pregnant, is between the 30th day and 60th day of the pregnancy. Statistically there is a 10% chance of a lost pregnancy during this time frame. The causes for the possible pregnancy losses are many from poor implantation attachment to genetic defects in the embryo. Once the 60th day of pregnancy is passed one can assume that the percentage of fetuses lost would be the same as is in a conventional pregnancy-in the 2-3% range.

#### Conclusion:

Embryo Transfer is not a useful technique for everyone in the cattle business, however it can play an important role in quickly expanding a herd, preserving genetics, or improving the genetic base of a herd. Everyone has different goals in the cattle business, and a decision to employ ET as part of a business plan, should be based on sound economics rather than on the emotional response “everyone is doing it”. It is important to realize that production of a quality live calf from an IVF embryo often has a low percentage positive outcome simply because either the embryo doesn't take or the calf is not as good as expected. For most cattle breeders both buying and/or producing IVF embryos does not “pencil out” despite what the so called experts say. Too many risks and too much cost. Selective use of ET can work but it is not the best answer to build a well constructed, quality herd. To me it is often another shortcut that cattle breeders take hoping that it moves them into the limelight. My experience tells me it is often fraught with disappointment because there was not adequate research prior to its utilization in a herd and expectations were simply too high; although, that said, we have had some excellent calves produced from rare old Heritage Shorthorn semen by utilizing IVF.

Future Topic: Shorthorns In Tasmania, Australia