FORMULATING ET CONTRACTS

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INTRODUCTION

Veterinarians can serve some of their more progressive commercial cow-calf clients by introducing them to the option of becoming an embryo transfer (ET) contract recipient herd. Contract recipient herds receive embryos from owners of purebred herds, have those embryos transferred to their synchronous recipient cows, calve and raise those ET calves to weaning when they are sold back to the embryo owners. A veterinarian can assist in this process by providing advice and services related to reproductive management, herd health, ET and contractual relations between the contract recipient herd owner and the embryo owner. The objective of this presentation will be to present pertinent information on the operation of contract recipient herds from the viewpoints of the embryo owner, the contract recipient herd owner and the veterinarian.

ESTABLISHING AN ET RECIPIENT HERD

Contract recipient operations are generally started by well-managed, commercial, beef, cow/calf herds that have the ability to: handle cows efficiently; synchronize and detect estrus; facilitate the transfer of embryos; perform pregnancy diagnosis and are able and willing to collect accurate birth and weaning weights on ET calves. Most contract ET herds have successfully employed an AI program in the past. Producers using their herd to raise ET calves can add value to their calf crop and increase revenue to more than cover additional management costs. A veterinarian's role in this process extends from the traditional one of prescribing a solid herd health program and consulting on reproductive management to the more non-traditional role of providing advice on contractual agreements between the contract recipient herd owner and the embryo owner.

A contract between the embryo owner and the contract recipient herd owner is an essential part of the program. A well-written contract insures a clear understanding between the contract herd owner and the embryo owner. It should describe the duties and expectations of each party. The signed contract should be in place before any activity on the part of the embryo owner or herd owner takes place.

Duties and Responsibilities of the Embryo Owner. Requirements placed on the embryo owner should act to secure a financial obligation for the recipient herd owner and insure that the reproductive efficiency of the contract recipient herd is not compromised. Embryo owners must deliver the embryos well in advance of the scheduled transfer date. Records from the ET practitioner that collected and froze each embryo, including the mating, embryo development stage, and embryo quality grade must accompany the embryos. Embryos should be graded according to International Embryo Transfer Society (IETS) guidelines. Although grading is

somewhat subjective, a good correlation between embryo quality grade and pregnancy rates following ET does exist. Pregnancy data from a large ET recipient herd that received frozen embryos from 16 different sources are shown in Table 1. The data indicate that pregnancy rate decreases as the quality of frozen/thawed embryos decreases. The quality grade and stage of the embryos accepted by the recipient herd owner should act to prevent a low pregnancy rate. Recipient herd owners usually insist on transferring only Grade 1 or 2 embryos.

Table 1. The Effects of Freezing Method and Embryo Quality on Pregnancy Rate

	Embryo Quality			
Freezing Method	**Grade 1**	**Grade 2**	**Grade 3**	**Total**
Ethylene Glycol	64.1% (321/501)	51.6% (144/279)	100% (3/3)	59.8% (468/783)
Glycerol	60.6% (63/104)	51.9% (42/81)	31.3% (5/16)	54.7% (110/201)
Total	63.5% (384/605)	51.6% (186/360)	42.1% (8/19)	58.7% (578/984)

A cash deposit should be required from the embryo owner with the signed contract or at the time of embryo delivery. This advanced revenue helps the recipient owner cash-flow some of the expenses, and insures that the embryo owner is financially committed. The deposits are non-refundable, but are applied to the final balance due at the time of delivery.

The embryo owner must agree to purchase the calves at a predetermined set price or at a price based on a predetermined formula. Most recipient herd owners know their input costs and would prefer to set a price for each calf. Embryo owners are more likely to prefer formula pricing. Most price formulas vary with feeder calf market price with premiums and incentive clauses included to encourage the contract herd owner to manage the ET calves well. Regardless of the pricing system, the price is usually graduated, offering discounts for larger numbers of embryos transferred. Charges for delaying delivery and holding calves beyond weaning are the responsibility of the embryo owner.

It is important for the ET calves to be in a condition that is acceptable to the embryo owner at the time of delivery. This seems like common sense if the contract herd owner intends to gain the embryo owners repeat business, however, in some cases the two parties can have very different opinions about what is “acceptable.” Some contracts allow the embryo owner to refuse any undesirable calves. Most recipient owners, however, insist on being paid for every calf, otherwise, embryo owners could reject calves based on sex or poor performance that is out of the control of the recipient herd owner. Obviously, it is essential that the embryo owner and recipient herd owner have a clear understanding of acceptable and unacceptable calves.

To clarify the limits of acceptability of calves to be delivered, as many criteria as possible should be spelled out in objective terms. Minimum weights or weights per day of age should be negotiated. Blemishes that make the marketing of the purebred calves more difficult should be noted (pink-eye lesions, frozen ears, warts, etc.) and a limit on the number of calves with blemishes that must be accepted by the embryo owner can be set. Clauses placed in the contract that define acceptability criteria may seem petty at the time the contract is negotiated, but they are much more difficult to negotiate settlement over at the time calves are ready for delivery.

Duties and Responsibilities of Recipient Herd Owner. The recipient owner furnishes synchronous recipients and transfers the embryos for specific calving dates. The practitioner employed to perform transfers is usually the choice of the recipient herd owner, however, the embryo owner may require the practitioner to be AETA certified or request a specific practitioner to perform the transfers. The cost of the transfers is usually included in the set calf price or pricing formula proposed by the recipient herd owner. However, if an embryo owner requests a specific practitioner, the recipient herd owner may wish to have that service direct-billed to the embryo owner. By including the transfer cost in the overall calf price, in some cases the recipient herd owner can derive profit by negotiating a more economical fee schedule with the ET practitioner.

Expected calving dates are important to the embryo owner because of marketing options for breeding animals or due to age restrictions placed on show cattle. Having both a spring and fall calving season may increase the number of prospective clients for the recipient herd owner.

Pregnancy diagnosis after ET is a good reproductive management practice and the information allows the embryo owner to make genetic management or marketing decisions before the ET calves are born. The cost for pregnancy diagnosis, fetal sexing, and obstetrics are issues to be negotiated between the parties. Pregnancy diagnosis cost is usually included in the overall calf price paid at delivery because it is a standard practice. However, pregnancy diagnosis must be performed at the appropriate time to allow parentage to be determined. Ultrasonography for fetal sexing is a specialized procedure that has become more common in ET programs. Using ultrasound to diagnose pregnancy and to detect fetal sex at 60 to 90 days of gestation poses an additional cost to the contract herd owner. Some contracts absorb the cost of fetal sexing into the overall price of the calf and tout the practice as an advertising tool.

Proper identification of the calves and collection of accurate weights is critical to the long-term success of a contract recipient herd. Calves need to be tagged and weighed at birth. Recipients need to be double identified and I.D.s cross-referenced when the embryo is transferred and when the calf is born. Records for individual birth weights to the nearest pound should be recorded. Weaning weights should be recorded under standardized conditions (same time off feed/water) and on the same date for all calves returning to one owner.

The cost of successful and unsuccessful assisted calvings must be addressed in the contract. In addition to refusing to accept embryos based on quality standards, most contract herd owners reserve the right to refuse embryos based on the expected birth weight of the calves. The most reliable indicator of birth weights for calves of beef breeds is the birth weight EPD of the sire and dam. Embryos from sires or dams with birth weight EPD's above average for their respective breed may pose an unrealistic threat of dystocia and calf mortality in some recipient herds. Some recipient herd owners may refuse to accept embryos with high birth weight EPDs. Those that do not refuse embryos based on a birth weight EPD, may simply require the embryo owner to assume all costs associated with assisted deliveries, including the cost resulting from dead recipients. Negotiating an agreement on how to manage the risk of dystocia protects both the recipient herd owner and the embryo owner.

Many embryo owners like to have calves receive creep feed prior to weaning. Creep feeding increases weaning weights, improves body condition and makes the post-weaning transition to feed less stressful. Depending on the pricing formula, it may or may not be in the best interest of the recipient herd owner to creep feed the calves. If the contract has an incentive for additional weight per day of age or a penalty for calves that are light at the time of delivery, creep feeding is likely to benefit both the recipient herd owner and the embryo owner. If calves are sold at a set price, without minimum weight parameters or incentives, then creep feeding represents an extra, unrecoverable cost to the recipient herd owner. In the latter case, the cost of creep feeding can be negotiated as a separate part of the contract.

Calves will need to be vaccinated and dewormed in a fashion acceptable to both parties. Most recipient owners provide vaccines and parasiticides as part of the purchase price. The vaccination and deworming program should provide an adequate defense against the risks posed to calves in the contract recipient herd and in the herd to which the calves are delivered

OPPORTUNITIES FOR THE VETERINARIAN

Establishing a successful contract recipient herd program offers veterinarians a number of opportunities to assist both the recipient herd owner and the embryo owner.

Risk Management. One role of the veterinarian is to inform contract recipient herd owners and their clients of potential outcomes, good and bad. Results of ET programs can be variable. Small sample sizes can make results look better or worse than "real." The larger the number of embryos transferred, the greater the number of donors collected and if embryos are frozen by practitioners with reliable reputations, the risk of achieving poor results is minimized. However, to appease embryo owners, the contract ET program must achieve conception rates over 50%.

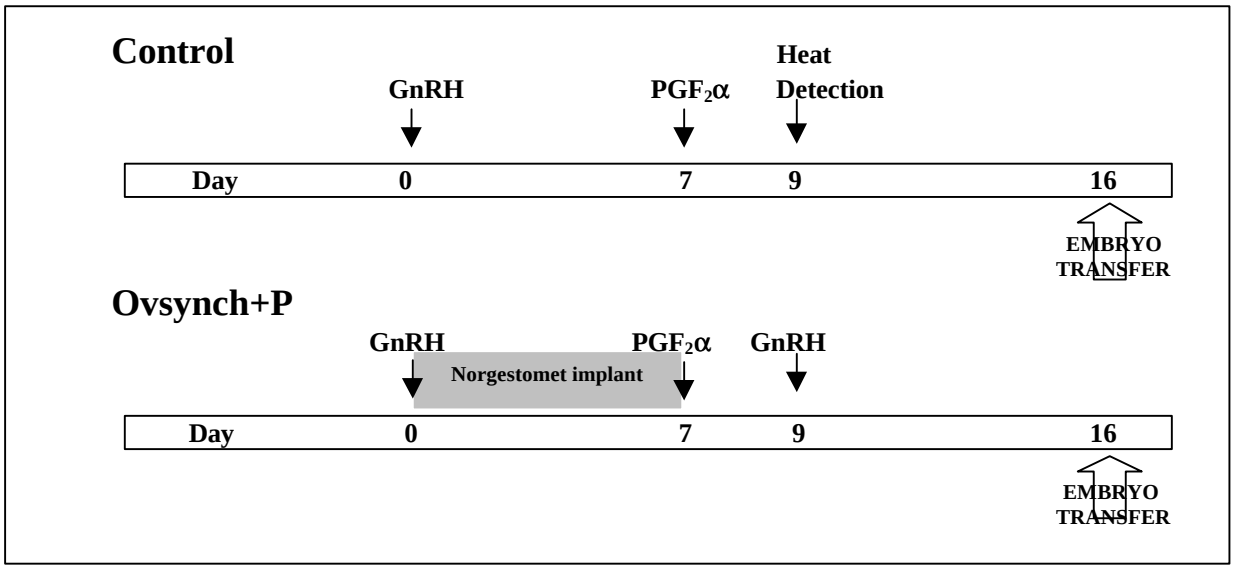
Recipient Health and Synchronization. Recipient cows or heifers that are in good body condition, properly immunized, healthy, and can be effectively treated to synchronize estrus are the most important element in a contract recipient herd. Regardless of the contractual agreement, both parties will be disappointed if the recipient cows fail to become pregnant.

A myriad of synchronization programs is available to set up recipients for ET. The veterinarian can assist the recipient owner by identifying the program(s) that will best suit the cows, labor and facilities of the recipient herd. The use of prostaglandin $F_2\alpha$ ($PGF_2\alpha$) to synchronize estrus requires the least labor, however, injections of Lutalyse or Estrumate only synchronize estrus in cycling cows and heats are usually spread over four to six days. Injection of gonadotropin-releasing hormone (GnRH) 7 days prior to $PGF_2\alpha$ decreases the variation in the timing of heat. However, synchronization programs utilizing progestins (SYNCRO-MATE B or the SMB implant plus $PGF_2\alpha$) have produced the most desirable estrus synchronization. Programs utilizing additional gonadotropin-releasing hormone (GnRH) injections to control ovulation are becoming popular for ET programs because they eliminate the need for heat detection.

Ashby Embryos conducted an experiment comparing ovulation control and timed ET with ET after detection of a synchronized estrus (Figure 1). Every recipient in the ovulation control group with an acceptable corpus luteum (CL) 7 days after injection of GnRH to induce ovulation

received an embryo. Only animals detected in heat in the Control group received embryos. Grade 1 or 2 frozen embryos were thawed by one technician and transferred to suitable recipients by a single practitioner. Embryos frozen at different stages of development were assigned for transfer to recipients in the ovulation control group (Ovsynch+P) based on an "assigned" time of estrus that was coincident with the second injection of GnRH.

Figure1. Diagrammatic Representation of Estrus Synchronization Treatments



Conception rate (no. pregnant/no. transferred) was slightly lower in the ovulation control group, however, more cows treated to control ovulation received an embryo (92 vs 64%). Therefore, the number of pregnancies was higher in the ovulation control group (Table 2).

Table 2. The Pregnancy Rate in Recipients Treated to Synchronize Estrus or Control the Timing of Ovulation

Treatment	No.	Conception Rate/ Transfer[1]	PregnancyRate/ Recipient
Control	169	67/108 = **62%**[a]	67/169 = **40%**
Ovsynch+P	165	82/152 = **54%**[b]	82/165 = **50%**

[a,b] means with different superscripts are significantly different (P<.07).

Embryo Transfer. The transfer of frozen thawed embryos has been revolutionized by direct transfer technology. Embryos frozen in ethylene glycol can be transferred directly to the recipient without manual rehydration. Micromanipulation equipment and embryo handling techniques are no longer necessary. Direct transfer technology allows practitioners with limited ET experience to become involved in ET programs.

Basic knowledge of freezing methods, embryo stage, embryo grade, and embryo/recipient synchrony are essential to the practitioner transferring embryos. Practitioners need to understand embryo staging and recipient synchrony to minimize the asynchrony between the embryo and

recipient. Table 3 illustrates the approximate age of embryos in days relative to the IETS stage. Embryo stage and timing of heat in the recipients should be synchronized so that $\pm$ 24 hours is the maximum asynchrony. Fresh embryos have a higher tolerance for asynchrony than frozen/thawed embryos.

Table 3. Relationship Between Embryo Development and Synchronous Recipient Heat.

Embryo						
Stage	3	4	5	6	7	8
Age (days)	6.0	6.5	7.0	7.5	8.0	8.5
Recipient						
Days since heat	6.0	6.5	7.0	7.5	8.0	8.5

Palpation skills and accurate heat detection are essential for high conception rates. At the time of transfer, 6 to 8 days after estrus detection or induced ovulation, recipients should be palpated per rectum to verify the presence of a CL. If heat detection accuracy is high, recipients rejected for undesirable or absent CL's should be <10%. After detection of a CL, thawed embryos should be transferred into the uterine horn ipsilateral to the palpable CL. Data from Dr. Richard Steel (Table 4) indicates that the placement of frozen/thawed embryos must be at least midway between the internal bifurcation and the oviductal end of the uterine horn to achieve maximal pregnancy rates. An experiment at Virginia Tech also indicated that pregnancy rates were lower when embryos were deposited near the internal bifurcation.

Table 4. Pregnancy Rate Following Transfer of Frozen/Thawed Embryos

Embryo Placement	**No. Transferred**	**Pregnancy Rate**
Shallow (near bifurcation)	179	44.7%
Mid-uterine horn	579	52.7%
Deep (upper 1/3 of horn)	698	56.9%

Paperwork after the transfers must be completed accurately by the practitioner to enable the embryo owner to have information necessary for registration of the ET calves. Appropriate forms can be obtained from the Holstein Association. The American Embryo Transfer Association and the International Embryo Transfer Society can also provide assistance.

CONCLUSION

Establishment of a contract recipient herd may allow a veterinarian's progressive commercial cow-calf clients to increase their revenue. The endeavor opens the door for the practitioner to provide a wider array of services. Those services may be traditional (reproductive management, herd health, etc.) or they may be non-traditional (consultation on contractual arrangements, mediation, etc.). The establishment of herds of recipients may also enable a practitioner not previously involved in ET to develop the practice of transferring embryos frozen for direct transfer. The veterinarian's role in a contract recipient program can vary. That role and the impact of the involvement will depend on the practitioner's understanding and comfort level with contract ET recipient programs.